NATIONAL ANNUAL SURVEY OF AVIATION FUELS, 1955

BY O. C. BLADE

Information Circular 7747

UNITED STATES DEPARTMENT OF THE INTERIOR
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FOREWORD

This and succeeding publications concerning analyses of petroleum products in commercial use (which include surveys on aviation gasoline, motor gasoline, and diesel fuel) will be issued as Information Circulars instead of Reports of Investigations as in the past. This change is being made in accordance with Bureau of Mines policy which restricts the use of Reports of Investigations to the presentation of results of original Bureau of Mines research. Previous publications dealing with aviation fuel are Reports of Investigations 4789, 4889, 4982, 5036, and 5132.

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O. C. Blade 1/

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1/ Petroleum chemist

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INTRODUCTION

This report on the properties of aviation gasolines and aviation jet fuels produced in the United States during 1955 was made under a cooperative agreement between the American Petroleum Institute and the Bureau of Mines of the United States Department of the Interior.

Analytical data are presented for 116 samples of aviation gasoline and for 38 samples of aviation jet fuel. The analyses were made on samples typical of the manufacturers' 1955 production in their laboratories and the results submitted to the Bureau of Mines for compilation. The products of 20 manufacturers of aviation gasolines and of 16 producers of aviation jet fuels are represented.

SUMMARY

A comparison of certain properties of the commercial aviation gasolines produced in the United States during 1953, 1954, and 1955 is presented in table 1, the 1955 data being average values from tables 3 through 7 of the present report. Trends in certain characteristics of these fuels may be seen in figures 1 through 5 which also indicate the minimum and maximum values. A list of aviation-fuel survey reports published by the Bureau of Mines is given on page 7.

Table 2 presents a summary of data from table 8 and compares properties of aviation jet fuels of 1955 with summarized data on jet fuels of 1951, 1952, 1953, and 1954.

INSPECTION TEST DATA OF AVIATION GASOLINE

The values for the properties of the aviation gasolines were compiled from data submitted on their products by 20 manufacturers. A total of 116 samples of aviation gasoline is represented, of which 34 are for commercial use only, 24 are for military use only, and 58 are designated for both commercial and military use. The analyses are tabulated according to the following grades: 80/87, 91/96, 100/130, 108/135, and 115/145. In each grade the analyses are tabulated in the order of commercial only, commercial and military, and military only.

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TABLE 1. - Comparison of some average data for commercial aviation gasolines

Test	Grade 80/87			Grade 91/96			Grade 100/130			Grade 108/135			Grade 115/145		
	1953	1954	1955	1953	1954	1955	1953	1954	1955	1953	1954	1955	1953	1954	1955
Octane number:															
Lean mixture	81.8	81.8	82.2	92.5	93.3	94.2	Iso+ 0.15	Iso+ 0.19	Iso+ 0.21	Iso+ 0.34	Iso+ 0.32	Iso+ 0.32	Iso+ 0.59	Iso+ 0.64	Iso+ 0.71
Rich mixture	87.7	87.9	88.4	98.4	98.6	98.7	Iso+ 1.35	Iso+ 1.35	Iso+ 1.34	Iso+ 1.76	Iso+ 1.75	Iso+ 1.77	Iso+ 2.88	Iso+ 2.92	Iso+ 2.92
Tetraethyllead ml./gal.	0.52	0.43	0.44	3.96	3.78	3.65	4.05	3.81	3.75	2.99	3.10	2.89	4.56	4.51	4.51
Performance number:															
Lean mixture	-	-	-	-	-	-	106	107	108	111	111	111	118	119	120
Rich mixture	-	-	-	-	-	-	131	131	131	136	136	136	146	146	146
Reid vapor pressure lb.	6.4	6.5	6.4	6.6	6.4	6.4	6.6	6.6	6.6	6.6	6.6	6.7	6.5	6.6	6.5
D86 dist. temp.:															
10% evap. ° F.	148	147	148	148	147	148	148	146	148	148	146	147	148	147	150
50% evap.	191	192	194	192	192	193	204	204	206	212	215	214	212	212	212
90% evap.	237	234	237	236	233	237	246	245	245	246	251	249	246	245	244
Slope at 10 percent evap.	1.6	1.7	1.9	1.8	1.7	1.8	2.1	2.1	2.3	2.4	2.3	2.4	2.4	2.5	2.6
Visc., kinematic, 70° F.-cs.	0.609	0.619	0.604	0.616	0.608	0.602	0.627	0.632	0.617	0.643	0.634	0.642	0.637	0.633	0.650

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TABLE 2.- Summarized data on aviation jet fuels

Inspection test	Grade JP-1		Grade JP-3							Referee JP-3 1951
	1951	1952	1951	1952	1953		1954	1955		
Number of fuels	9	3	23	6		1/ 2	4		1/ 2	1
Gravity, ° API	42.2	42.3	53.7	52.5	55.6,	50.7	56.5	55.3,	58.9	47.1
Distillation temp.:										
10% evap., ° F.	345	338	163	166	165,	194	160	142,	150	151
50% evap.	378	368	313	316	301,	340	265	220,	261	344
90% evap.	437	421	435	433	446,	426	421	445,	413	480
400° F. point, percent evap.	-	-	-	-	-	-	84	71,	86	-
Reid vapor pressure, lb.	-	-	5.9	6.0	5.7,	5.5	5.7	6.3,	5.5	6.9
Freezing point, ° F.	<-76	<-76	<-76	<-76	<-76,	<-76	<-76	<-76,	<-76	<-76
Viscosity, kinematic, -40° F., cs.	8.29	8.59	2.91	-	-,	3.26	2.15	1.8,	-	3.36
Water tolerance, ml.	0.0	0.0	0.0	0.0	0.0,	0.0	0.0	0.0,	0.0	0.0
Aniline point, ° F.	132.8	-	134.5	123.9	132.9,	124	130.5	127.5,	135.0	107
Aniline-gravity constant	5,604	-	7,223	6,505	7,389,	6,287	7,373	7,051,	7,952	5,040
Bromine No., gm. Br/100 gm.	0.95	1.57	2.59	2.30	1.52,	1.54	1.06	0.4,	1.2	7.3
Sulfur										
Total, wt. percent	0.079	0.057	0.085	0.081	0.077,	0.048	0.089	0.04,	0.08	0.35
Mercaptan	0.0009	0.0017	0.0008	0.0010	.003,	.001	.001	0.001,	0.003	0.0005
Aromatic content, vol. percent	14.3	14.3	11.3	14.7	12.3,	16.0	10.3	9.0,	9.7	25
Olefin content	-	-	-	-	-	-	.6	.6,	.6	-
Smoke point	-	-	-	-	-	-	29.4	26,	29	-
Smoke volatility index	-	-	-	-	-	-	64.7	55.8,	65.1	-
Gum,										
Existent:										
Air-jet, 400° F., mg./100 ml.	1.4	1.7	1.7	0.9	0.7,	0.4	1.6	-	0.2	1.2
Steam-jet, 450° F.	-	-	2.2	-	-,	.4	1.5	1,	-	1.8
16-hr. accelerated:										
Air-jet, 400° F.	1.5	1.5	4.1	5.9	1.5,	2.9	1.8	-	1.2	8.4
Steam-jet, 450° F.	-	-	3.7	-	-	2.4	1.9	1,	-	11.4
Heat of combustion, net, Btu/lb.	18,556	18,551	18,717	18,642	18,716,	18,555	18,715	18,700,	18,773	18,484
Hydrogen-carbon ratio	0.1610	-	0.1649	-	-	0.1575	0.1680	0.16	0.175	0.1570

TABLE 2.- Summarized data on aviation jet fuels (cont.)

Inspection test	Grade JP-4						Referee JP-4				Grade JP-5			
	1951		1952	1953	1954	1955	1952	1953	1954	1955	1953	1954		1955
Number of fuels		1/ 2	24	28	23	30	1	1	1	3	1		1/ 2	3
Gravity, ° API	53.6,	55.1	50.5	51.8	51.5	52.2	45.6	45.4	48.1	48.4	37.3	37.8,	41.0	39.8
Distillation temp.:														
10% evap., ° F.	216,	193	222	220	216	219	238	240	244	229	397	384,	395	392
50% evap.	289,	297	332	324	319	318	348	349	361	357	432	418,	424	428
90% evap.	407,	440	430	421	425	412	455	461	457	469	491	470,	480	485
400° F. point, percent evap.	-	-	-	-	82.5	85	-	-	72.0	68.9	-	27.5,	16	17.0
Reid vapor pressure, lb.	2.5,	3.0	2.6	2.5	2.6	2.6	2.3	2.2	2.5	2.5	0.5	0,	-	-
Freezing point, ° F.	<-82,	-78	<-76	<-76	<-76	<-76	<-76	<-76	<-76	<-67	-54	<-40,	-59	<-40
Viscosity, kinematic, -40° F., cs.	2.51,	-	4.18	3.68	3.26	2.97	3.73	3.80	3.41	-	19.4	12.1,	13.36	13.20
Water tolerance, ml.	0.0,	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0,	0.0	0.0
Aniline point, ° F.	140,	137.9	133.9	134.8	133.8	135.5	110.8	106.5	131.4	134.9	136	129,	146	144.4
Aniline-gravity constant	7,504	7,598	6,762	6,983	6,891	7,073	5,052	4,835	6,320	6,529	5,073	4,876,	5,986	5,747
Bromine No., gm. Br/100 gm.	0.96,	1.4	1.91	1.63	1.59	1.51	13.0	19.6	5.60	1.4	4.3	3.7,	0.80	3.10
Sulfur														
Total, wt. percent	0.074,	0.119	0.075	0.074	0.080	0.065	0.301	0.265	0.177	0.199	0.46	0.33,	0.075	0.167
Mercaptan	.003,	0.0017	0.0010	0.0014	0.0016	0.0013	.003	.002	.001	.001	0.003	0.001,	.001	0.0012
Aromatic content, vol. percent	12.2,	10.0	11.9	11.9	11.3	10.8	20.4	20.3	16.4	14.2	8.3	20.3,	15.13	12.0
Olefin content	-	-	-	-	1.3	1.3	-	-	2.3	.9	-	.9,	.87	3.1
Smoke point	-	-	-	-	28.7	30.3	-	-	23	23.3	-	21,	21	22.0
Smoke volatility index	-	-	-	-	63.4	66.0	-	-	53.2	52.2	-	33,	27.7	29.1
Gum														
Existent:														
Air-jet, 400° F., mg./100 ml.	1.4,	0.0	1.2	1.3	1.3	-	3.8	2.8	1.4	-	3	2,	-	-
Steam-jet, 450° F.	3.2,	.4	-	.7	.6	0.9	-	-	1.0	1.0	2	1,	1.0	0.9
16-hr. accelerated:														
Air-jet, 400° F.	6.2,	1.0	3.3	2.9	-	-	19.0	13.4	14.5	-	5	2,	-	-
Steam-jet	3.2,	.3	-	1.7	2.5	2.4	-	-	9.3	5.6	4	1,	2.0	1.6
Heat of combustion, net, Btu/lb.	18,756,	18,735	18,671	18,714	18,678	18,674	18,452	18,467	18,582	18,613	18,474	18,391,	18,569	18,525
Hydrogen-carbon ratio	0.1605,	0.1709	-	0.1649	0.1635	0.156	-	-	0.162	2/ 0.137	0.159	0.157,	0.151	0.148

1/ As only two samples are represented, average values were not computed.
2/ Test on one sample.

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Each item number in tables 3 through 7 designates a separate sample. The analysis for each consists of the following test results: Octane numbers for lean and rich mixtures (octane numbers for 100 or below, isooctane plus milliliters tetraethyllead above 100), performance numbers (for grades 100/130, 108/135, and 115/145), tetraethyllead content, distillation characteristics, Reid vapor pressure, copper-dish gum, potential gum, visible lead precipitate, water tolerance, net heat of combustion, aniline point, gravity, freezing point, sulfur content, kinematic viscosity at 70° F., gum inhibitor content, color of fuel, copper-strip corrosion, acidity of distillation residue, and oxidation (gum) inhibitor. The performance numbers have been recorded to the nearest whole unit as the rating methods are considered accurate only to that extent. ASTM or FS number designations 2/ are used with the test names to indicate the test procedures in most of the column headings of tables 3 through 7. An exception to the method is indicated by a footnote. Also listed are aniline-gravity constants as reported. Average values of the tests are given at the foot of each table for the number of samples indicated.

The results of three tests--color, copper-strip corrosion, and acidity of distillation residue--are given in the following tabulation rather than in columns in the tables. Several samples were tested for copper-strip corrosion and acidity of distillation residue by equivalent company methods. The results are given as "Number 1" according to the latest method for reporting corrosion test results, although some of the tests were reported as its equivalent "0," in accordance with ASTM D130-53T.

2/ American Society for Testing Materials, ASTM Standards on Petroleum Products and Lubricants (With Related Information): Philadelphia, 1954, 954 pp.; ASTM Manual of Engine Test Methods for Rating Fuels, 1952, Philadelphia, 1952, 342 pp.; 1953 Supplement to ASTM Manual of Engine Test Methods for Rating Fuels, 1953, 46 pp.

Federal Specification VV-L-791e, May 21, 1953, Lubricants, Liquid Fuels and Related Products: Methods of Inspection, Sampling, and Testing, Federal Standard Stock Catalog, Section IV, Part 5, and preceding recent editions.

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Grade	No. of fuels	Color of fuel	Copper-strip corrosion (air-well method) ASTM D130-54T	Acidity of distillation residue ASTM D1093-52
80/87	19	Red 1/	No. 1	Neutral
91/96	21	Blue	No. 1	do.
100/130	35	Green	No. 1	do.
108/135	9	Brown 2/	No. 1	do.
115/145	32	Purple	No. 1	do.

1/ One fuel of this grade, item 18, was colorless.
2/ Color of 1 sample, item 84, was purple.

The analyses of aviation gasolines for military purposes only are listed separately. The averages of the tests, however, include the values of gasolines designated for both commercial and military use and are so indicated by footnotes.

TRENDS OF AVIATION GASOLINE CHARACTERISTICS

Summarized data of the average values of the tests of commercial aviation gasolines in the present survey, compared with those of previous surveys, by years, are shown in tables 9 through 13. Data for 1947, 1948, and 1949, when two surveys a year were conducted, are condensed to show averages of the test results for each year, based on the respective numbers of samples represented.

Figures 1 through 5 illustrate trends of certain distillation values, Reid vapor pressure, tetraethyllead content, kinematic viscosity at 70° F., and slope at 10 percent for the 5 grades of commercial aviation gasoline. Minimum and maximum values in the figures were obtained from the detailed tables in the series of reports. As data on grade 108/135 fuels were not included in the survey reports until 1952, the plots in figure 4, on comparable-size charts, are shown only for the last 4 years. Graphs showing trends of octane and performance numbers have not been prepared, because no variations exceeding the reproducibility of the test methods were found.

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INSPECTION TEST DATA OF AVIATION JET FUELS

Analyses of 2 samples of grade JP-3 jet fuel, 30 samples of JP-4, 3 samples of JP-4 referee jet fuel, and 3 samples of JP-5 jet fuel are shown in table 8. Each complete analysis consists of data for 20 tests: Gravity, distillation, Reid vapor pressure, Tag closed-cup flash point, freezing point, color, viscosity at -30° F. in centistokes, water tolerance, aniline point, bromine number, total and mercaptan sulfur in weight percents, copper-strip corrosion, aromatic and olefin contents, smoke point, existent gum by steam-jet at 450° F., 16-hour accelerated (potential) by steam-jet at 450° F., net heat of combustion, and hydrogen-carbon ratio. These data were supplied by 16 manufacturers of aviation jet fuel. The tests were conducted in company laboratories by procedures approved by the American Society for Testing Materials, 3/ and in accordance with military specifications MIL-F-5624C and MIL-F-5161C, and Amendment 1. 4/ Average values are shown for grades JP-4, JP-4 referee fuels, and JP-5 jet fuels in table 8. Averages are not given if the samples tested are too few, or for properties such as color and flash point which are not considered additive. Table 2 presents a summary of data on aviation jet fuels tested in 1951, 1952, 1953, 1954, and 1955.

Results of two tests no longer are tabulated--existent gum by air jet at 400° F. and 16-hour accelerated (potential) gum by air jet at 400° F.--as these determinations generally have been superseded by procedures using steam jet at 450° F. Figures are computed for aniline-gravity constant and smoke volatility index. Many of the figures for net heat of combustion are computed values from a formula developed by the National Bureau of Standards in cooperation with the American Society for Testing Materials. Values determined by methods other than indicated in the headings of table 8 are shown by footnotes.

3/ See footnote 2.

4/ Military Specification, Fuel, Aircraft Turbine and Jet Engine, Grades JP-3, JP-4, and JP-5, MIL-F-5624C, May 18, 1955, 6 pp.; Military Specification, Fuel, Referee, Aircarft Turbine and Jet Engine, MIL-F-5161C, December 4, 1953, 5 pp., and Amendment 1, January 15, 1954.

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LIST OF NATIONAL AVIATION FUEL SURVEY REPORTS

Author	Production date	R.I. No.	Published	Pages
In cooperation with the Coordinating Research Council, Inc.				
Holliman, W. C. & others	Mar. 1947	4273	May 1948	16
Do.	July 1947	4353	July 1948	16
Do.	Jan. 1948	4424	Nov. 1948	16
Do.	July 1948	4435	Nov. 1948	17
Do.	Jan. 1949	4529	May 1949	17
Blade, O. C.	Oct. 1949	4664	Mar. 1950	14
In cooperation with the American Petroleum Institute				
Blade, O. C.	Oct. 1950	4789	Mar. 1951	11
Do.	Oct. 1951	4889	May 1952	13
Do.	1952	4982	May 1953	15
Do.	1953	5036	Feb. 1954	15
Do.	1954	5132	Apr. 1955	15
Do.	1955	This report.		

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TABLE 3.- Grade 80/87 aviation gasoline: Inspection data furnished by participating companies for their products, 1955

Item	Octane number: Lean mixture, ASTM D614	Octane number: Rich mixture, ASTM D909	Tetraethyllead, ml./gal.	Distillation, ASTM Method D86: Temperature (corrected to sea level) °F., Percent evaporated: IBP	5	10	15	20	30	40	50	70	90	95	EP	Sum 10+50	Percent: Res.	Loss	Slope of distillation curve at 10 percent	Reid vapor pressure, ASTM D323, lb.	Copper dish gum, A ASTM D910, mg./100 ml.	Potential gum, 16 hr., ASTM D873, mg./100 ml.	Visible lead precipitate, ASTM D873, mg./100 ml.	Water tolerance, ASTM D1094, ml.	Net heat of combustion, Btu per lb. 1/	Aniline point, ASTM D611, °F.	Gravity, ASTM D287, ° API	Aniline-gravity constant	Freezing point, FS 1411, °F.	Sulfur (uncorrected for TEL), ASTM D90, weight percent	Kinematic viscosity, ASTM D445, at 70° F., centistokes	Inhibitor content, lb. per 1,000 bbl.
Commercial aviation gasolines																																
1	83.5	87.5	0.51	115	138	151	156	161	173	186	198	214	231	250	310	349	1.0	1.0	1.8	5.9	1.4	1.5	0.0	0.0	18,961	147.9	70.4	10,412	<-76	0.007	0.60	-
2	82.0	87.5	.45	112	136	143	148	153	163	173	182	202	247	303	330	325	.8	1.2	1.2	6.6	1.0	.6	.0	1.0	18,894	139.3	67.2	9,361	<-80	.014	.60	2.1
3	80.5	88.5	.50	120	138	149	155	159	168	176	184	203	226	240	290	333	1.0	1.0	1.7	6.8	-	1.0	.3	.0	18,902	139.1	68.2	9,487	<-76	.02	-	7
4	82.3	88.3	.48	112	132	143	148	152	161	170	179	198	219	240	316	322	.4	.6	1.6	6.7	.6	1.0	.2	.0	19,028	157.8	75.9	11,977	<-76	.010	.53	2.0
5	84.0	89.6	.5	102	134	150	160	170	183	195	205	223	248	262	300	355	.2	.8	2.6	6.4	2	1	.0	.0	18,844	134	64.7	8,670	<-76	.009	.62	6.3
6	84.0	92.1	.42	119	144	150	154	158	165	171	180	197	223	238	287	330	1.0	1.0	1.0	6.2	1	1	.0	.0	18,917	139.4	69.3	9,660	<-76	.01	.589	8.2
7	83	90	.44	113	142	154	172	183	200	210	219	234	256	269	308	373	.5	.5	3.0	6.0	0	0	.0	.0	18,757	122	63.1	7,698	<-76	.02	.63	7.4
8 2/	81.2	87.6	.45	115	140	149	156	163	175	188	198	214	232	242	287	347	1.0	1.0	1.6	6.4	1	1	.0	.0	18,888	136.4	67.8	9,248	<-76	.004	.63	7.6
9 2/	81.4	87.7	.45	124	139	148	155	161	172	182	191	208	234	251	292	339	1	1	1.6	6.6	1	< .5	.0	.0	18,765	117.8	65.9	7,763	<-76	.01	.57	5.0
10 2/	81.0	88.0	.43	126	140	148	152	156	165	176	184	206	242	272	316	332	1.0	.0	1.2	6.4	1	1	.0	.0	3/ 18,900	144	71.0	10,224	<-76	.010	.57	2.0
11 2/	86.0	89.0	.53	114	131	149	162	171	188	201	212	225	240	256	296	361	1.0	1.0	3.1	6.3	1.0	1.8	.0	.0	19,003	158.0	71.7	11,329	<-76	.02	-	8.0
12 2/	86.0	87.4	.42	112	134	146	154	161	176	190	202	221	242	257	312	348	1	1	2.0	6.5	2	1.5	.9	.0	3/ 19,047	146.5	69.7	10,211	<-76	.010	-	4.5
13 2/	81.8	88.1	.49	115	137	147	152	157	167	177	184	205	243	272	314	331	1.0	1.0	1.5	6.4	<1.0	.6	.0	.0	18,829	130.3	65.3	8,509	<-76	.02	-	3.1
14 2/	81.3	88.8	.44	120	142	148	152	156	163	170	178	196	225	240	290	326	1.0	1.0	1.0	6.5	.4	.2	.0	.0	18,943	142.7	70.9	10,117	<-76	.011	.55	7.1
15 2/	80.8	87.8	.43	116	135	144	150	154	164	175	186	206	263	280	306	330	.7	1.0	1.5	6.8	.6	.4	.0	.0	3/ 18,888	134	68.5	9,179	<-76	.019	.623	6.7
16 2/	80.0	88.0	.44	110	140	153	161	167	180	191	199	210	220	230	262	352	1	.0	2.1	6.5	.0	3	.0	.0	18,792	124.5	64.7	8,055	<-76	.01	.69	.0
17 2/	80.0	88.0	.46	110	136	144	151	157	168	178	188	203	221	229	263	332	1	1	1.5	6.6	1	2	.0	.0	18,842	130.1	66.5	8,652	<-76	.01	.580	.0
18 2/	83.5	89.0	.03	110	130	152	159	168	181	192	202	218	237	261	322	354	1.0	1.0	2.9	5.7	-	.1	.0	.0	3/ 18,678	150.4	71.1	10,693	<-100	.001	.624	7.2
19 2/	80.4	87.6	.50	119	136	150	160	169	184	195	206	215	249	272	300	356	1.0	1.0	2.4	6.9	-	2	.0	.0	18,853	134.8	65.5	8,829	<-76	.03	.66	8.4
Average 19 samples	82.2	88.4	0.44	115	137	148	156	162	173	184	194	210	237	256	300	342	0.9	0.8	1.9	6.4	0.9	1.1	0.1	0.0	18,881	138.4	68.3	9,453	<-76	0.013	0.604	5.1
Military aviation gasolines																																
Average 4/ 12 samples	82.0	88.1	0.42	116	137	148	155	162	174	185	194	211	237	255	297	342	1.0	0.8	1.8	6.5	0.9	1.2	0.1	0.0	18,869	137.5	68.2	9,378	<-76	0.013	0.611	5.0

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TABLE 4.- Grade 91/96 aviation gasoline: Inspection data furnished by participating companies for their products, 1955

Commercial aviation gasolines

20	97.8	98.3	4.01	112	133	142	146	151	160	169	179	196	217	235	292	321	0.2	0.8	1.3	6.5	0.6	1.0	0.2	0.0	18,977	147.2	73.0	10,746	<-76	0.014	0.52	5.0
21	96.5	99.1	3.9	106	132	150	160	170	188	202	211	227	250	264	298	361	.5	1.0	2.8	6.1	1	1	.0	.0	18,828	131	64.7	8,476	<-76	.008	.62	6.9
22	94.0	99.6	2.12	120	146	149	155	158	165	172	180	197	223	238	286	329	1.0	1.0	.9	6.1	1	1	.0	.0	18,914	139.4	69.0	9,619	<-76	.01	.593	8.2
23	96	99	3.71	111	146	157	174	183	200	211	219	233	256	269	299	376	.5	.5	2.8	6.1	0	0	.0	.0	18,745	120.2	63.0	7,573	<-76	.02	.62	7.4
24	99	100	3.80	104	137	155	172	184	204	214	221	233	258	286	316	376	.7	1.3	3.5	6.6	2	1	.0	.0	18,833	131.4	65.0	8,541	<-76	.009	-	8.0
25	91.5	96.4	4.00	111	131	148	157	164	173	188	198	215	254	283	319	346	1.0	1.0	2.6	6.5	-	< .5	< .5	<.5	3/19,021	148	69.7	10,316	<-76	.02	-	8.4
26	96.5	100.0	4.0	116	144	153	162	168	177	186	193	209	228	245	297	346	1.0	.5	1.8	6.8	2.0	.5	.1	.0	18,913	141.2	68.3	9,644	<-76	.02	-	7
27	93.0	98.5	3.93	114	139	145	149	153	163	173	183	203	252	314	332	328	.9	1.1	1.0	6.7	1.0	.7	.0	<1	18,878	136.2	67.1	9,139	<-80	.018	.59	2.1
28 2/	92.5	98.5	3.69	121	137	144	150	157	167	171	182	190	234	260	302	326	1.0	1.0	1.3	6.3	1	1	.0	<1	18,837	128.0	67.2	8,602	<-76	.017	-	4.0
29 2/	98.5	100.0	3.93	122	140	145	149	154	161	170	179	203	238	260	308	324	1.0	.5	.9	6.4	1	1	.0	.0	3/18,850	141	70.6	9,955	<-76	.013	.57	4.0
30 2/	91.9	98.7	3.96	117	136	151	161	172	186	197	208	218	252	276	297	359	1.0	1.0	2.5	6.7	-	2	.0	.0	18,855	135.6	65.3	8,855	<-76	.03	.66	8.4
31 2/	95.8	99.5	3.76	119	134	148	156	163	174	184	193	212	233	267	308	341	1.0	1.0	2.2	6.2	-	.5	.0	.0	3/18,820	150.4	70.6	10,618	<-100	.006	.608	7.2
32 2/	92.5	98.5	3.95	119	146	153	158	162	172	182	191	205	216	222	250	344	1	.0	1.2	6.3	1	.0	.0	.0	18,829	128.9	65.9	8,495	<-76	.01	.69	6.7
33 2/	91.5	98.0	3.86	108	133	142	148	153	163	173	181	195	213	221	249	323	1	1	1.5	6.8	1	1	.0	.0	18,780	121.4	65.3	7,927	<-76	.01	.579	7.2
34 2/	91.8	98.0	2.94	112	135	142	146	151	160	169	178	194	235	268	302	320	.6	.8	1.1	6.9	1.0	.4	.0	.0	3/18,948	135	67.5	9,113	<-76	.02	.614	6.9
35 2/	93.0	99.0	2.86	120	139	145	150	154	161	170	178	197	225	242	282	323	1.0	1.0	1.1	6.5	1.0	.2	.0	.0	18,932	141.1	70.4	9,933	<-76	.010	.56	7.1
36 2/	91.7	98.4	4.00	116	137	146	152	156	166	176	184	205	244	271	318	330	1.0	1.0	1.5	6.1	< 1.0	.4	.0	.0	18,769	124.4	62.9	7,825	<-76	.02	-	8.4
37 2/	95.0	98.7	3.72	114	135	152	164	171	186	200	211	225	242	258	298	363	1.0	1.0	2.9	5.8	1.2	1.8	.0	.0	19,009	166.3	69.1	11,491	<-76	.02	-	8.0
38 2/	95.8	98.6	2.68	110	136	148	155	163	180	194	206	224	246	266	320	354	1	1	1.9	6.8	0	1.6	.6	.0	3/19,048	149.5	69.8	10,435	<-76	.040	-	8.4
39 2/	92.0	98.2	3.90	114	141	151	157	164	176	187	196	213	227	243	273	347	1.0	1.0	1.6	6.3	1	1	.0	.0	18,851	131.7	66.4	8,745	<-76	.004	.63	7.6
40 2/	91.5	98.3	3.96	124	139	147	154	159	168	176	184	202	228	243	287	331	1	1	1.5	6.2	1	1	.0	.0	18,756	117.8	65.1	7,669	<-76	.01	.58	5.0
Average	94.2	98.7	3.65	115	138	148	156	162	174	184	193	209	237	259	297	341	0.9	0.9	1.8	6.4	1.0	0.8	0.1	0.0	18,876	136.5	67.4	9,200	<-76	0.016	0.602	6.8
21 samples																															

Military aviation gasolines

Average 4/	93.3	98.6	3.63	117	138	147	154	160	171	181	190	206	233	254	292	337	1.0	0.9	1.6	6.4	0.9	0.9	0.0	0.0	18,868	136.2	67.4	9,180	<-76	0.016	0.610	6.8
13 samples																															

1/ Unless otherwise indicated, the figures for net heat of combustion are values computed from the formula recently developed by the National Bureau of Standards in cooperation with the American Society for Testing Materials:
$Q = 17,608 + 0.2054\,(AG) - 7.24\,(10^{-6})(AG)^2$ for sulfur-free gasoline, where AG is the aniline-gravity constant. Correct for sulfur content by the formula: $Q' = Q\,[1 - 0.01\,(\text{percent S})] + 43.7\,(\text{percent S})$.

2/ Fuel for commercial and military use.

3/ Determined value; ASTM D240-50, a company modified method, FS 2501.2, or FS 2502.3.

4/ The samples represented include those tabulated with commercial fuels which are indicated by footnote 2 in the same grade.

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TABLE 5.- Grade 100/130 aviation gasoline: Inspection data furnished by participating companies for their products, 1955

Item	Knock value: TEL in isooctane, ml./gal.: Lean mixture, ASTM D614	Knock value: TEL in isooctane, ml./gal.: Rich mixture, ASTM D909	Knock value: Performance number: Lean mixture	Knock value: Performance number: Rich mixture	Tetraethyllead, ml./gal.	Distillation, ASTM Method D86: Temperature (corrected to sea level) °F.: Percent evaporated: IBP	5	10	15	20	30	40	50	70	90	95	EP	Sum 10+50	Distillation, ASTM Method D86: Percent Res.	Distillation, ASTM Method D86: Percent Loss	Slope of distillation curve at 10 percent	Reid vapor pressure, ASTM D323, lb.	Copper dish gum, ASTM D910, mg./100 ml.	Potential gum, 16 hr., ASTM D873, mg./100 ml.	Visible lead precipitate, ASTM D873, mg.,/100 ml.	Water tolerance, ASTM D1094, ml.	Net heat of combustion, Btu per lb. 1/	Aniline point, ASTM D611, °F.	Gravity, ASTM D287, ° API	Aniline-gravity constant	Freezing point, FS 141, °F.	Sulfur (uncorrected for TEL), ASTM D90, weight percent	Kinematic viscosity, ASTM D445, at 70° F., centistokes	Inhibitor content, lb. per 1,000 bbl.
Commercial aviation gasolines																																		
41	0.19	1.38	107	131	2.92	108	134	149	160	169	189	205	216	229	249	263	325	365	1	1	2.6	6.9	0	0.3	0.2	0.0	2/19,061	157.0	70.7	11,100	<-76	0.014	-	6.5
42	.06	1.36	102	131	3.48	102	120	136	147	159	177	196	214	239	270	291	311	350	1.0	1.0	2.7	6.6	-	<.5	<.5	.0	2/18,798	125	65.4	8,175	<-76	.04	-	8.4
43	.05	1.35	102	131	4.00	108	128	143	155	164	177	189	202	214	238	267	325	345	1.0	1.0	2.7	6.8	1.0	1.0	.0	.0	18,925	143.6	68.6	9,851	<-80	.03	0.63	5.0
44	.1	1.30	104	130	3.98	113	132	142	147	151	160	169	180	202	224	241	283	322	.2	.8	1.5	6.7	.6	1.0	.2	.0	18,819	123.3	67.9	8,372	<-76	.009	.52	5.0
45	.00	1.29	100	130	2.97	116	138	146	153	156	166	177	187	205	228	248	275	333	1.0	.5	1.5	6.8	.4	.6	.0	.0	2/18,730	117	64.6	7,558	<-76	.011	.55	5
46	.43	1.38	114	131	3.88	110	135	155	169	180	198	208	214	221	230	245	279	369	1.0	1.0	3.4	6.5	.2	.6	.0	.0	19,026	166.1	72.0	11,959	<-76	.02	-	8.0
47	.40	1.33	113	131	3.9	106	136	150	160	172	188	205	215	228	248	265	315	365	.5	1.0	2.4	6.7	1	0	.0	.0	18,998	159	70.3	11,178	<-76	.009	.65	7.4
48	.34	1.30	112	130	3.90	106	134	145	151	159	171	185	195	211	229	244	273	340	1.0	1.0	1.7	7.0	1.0	1.0	.0	.0	18,995	154.0	72.1	11,103	<-76	.01	.594	8.4
49	.6	1.42	118	132	3.90	108	142	155	170	180	199	210	218	230	250	279	322	373	1.0	1.0	2.8	6.4	0	0	.0	.5	18,940	148	67.8	10,034	<-76	.007	.65	7.5
50	.39	1.36	113	131	3.95	106	135	155	171	184	201	214	218	229	246	270	311	373	.7	1.3	3.6	6.4	1	2	.0	.0	18,952	150	68.3	10,245	<-76	.002	-	8.0
51	.22	1.34	108	131	3.98	107	133	142	150	156	172	188	200	215	249	292	329	342	.8	1.2	1.7	6.7	1.2	1.0	.0	<1.0	18,991	156.2	70.7	11,043	< -80	.014	.64	2.1
52 3/	.41	1.32	114	131	3.99	112	136	146	152	158	172	185	198	218	244	262	326	344	1.0	.0	1.6	6.6	1	1	.0	.0	2/18,900	141	68.7	9,687	<-76	.013	.59	4.0
53 3/	.24	1.32	109	131	3.86	115	130	145	155	162	175	185	197	213	244	270	314	342	1.0	1.0	2.5	6.4	1	1	.0	<1	18,947	148.5	68.7	10,202	<-76	.019	-	3.9
54 3/	.21	1.30	108	130	2.93	113	137	154	168	179	194	206	217	220	251	279	313	371	1.0	1.0	3.1	6.8	-	2	.0	.0	19,003	161.8	70.3	11,375	<-76	.03	.67	8.4
55 3/	.20	1.32	107	131	4.53	113	136	151	164	175	190	203	214	230	246	269	305	365	1.0	1.0	2.8	6.9	-	2	.0	.0	18,974	154.3	69.5	10,724	<-76	.03	.66	8.4
56 3/	.16	1.43	106	132	3.97	112	132	153	168	176	191	205	215	230	258	273	328	368	1.0	1.0	3.6	6.0	-	.9	.0	.0	2/19,053	161.8	70.7	11,439	<-100	.002	.640	7.2
57 3/	.05	1.31	102	130	3.86	116	140	148	155	162	176	190	202	226	256	278	320	350	1	0	1.5	6.5	.0	.0	.0	.0	18,785	123.4	64.7	7,984	<-76	.01	.65	6.7
58 3/	.09	1.28	104	130	3.91	110	134	146	154	160	175	189	203	227	256	271	288	349	1	1	2.0	6.5	1	1	.0	.0	18,835	129.2	66.3	8,566	<-76	.01	.589	7.2
59 3/	.04	1.35	102	131	2.92	110	132	142	150	158	174	193	208	229	257	280	308	350	1.0	1.0	1.8	6.9	1.0	.4	.0	.0	2/18,953	136	66.7	9,071	<-76	.015	.610	7.1
60 3/	.08	1.45	103	132	2.92	111	142	152	161	167	182	194	203	219	240	267	323	355	1.0	1.0	1.9	6.8	1.5	.3	.0	.0	18,880	136.4	67.0	9,139	<-76	.010	.65	4.6
61 3/	.08	1.38	103	131	2.91	110	136	148	156	164	180	195	208	226	247	257	320	356	1.0	1.0	2.0	6.7	.9	1.0	.0	.0	18,974	151.7	70.4	10,680	<-76	.012	.59	7.1
62 3/	.19	1.38	107	131	4.44	109	135	145	152	157	167	178	187	205	229	260	314	332	1.0	1.0	1.7	6.4	<1.0	.6	.0	.0	18,961	150.1	69.4	10,417	<-76	.01	-	8.4
63 3/	.48	1.37	115	131	3.85	106	143	155	167	179	200	213	219	231	241	264	308	374	1.0	1.1	2.4	6.7	1	0	.0	.0	18,949	148.6	68.5	10,179	<-76	.002	-	7.6
64 3/	.30	1.30	111	130	3.89	108	136	148	157	166	175	213	218	233	250	264	290	366	1.0	1.0	2.1	6.8	1	1	.0	.0	19,010	160.5	71.2	11,428	<-76	.003	.68	7.6
65 3/	.04	1.30	102	130	4.00	121	135	145	152	159	169	180	189	211	235	251	300	334	1	1	1.7	6.4	1	2	.0	.0	18,753	118.1	64.8	7,653	<-76	.02	.55	5.0
66 3/	.10	1.31	104	130	4.56	103	127	141	152	160	178	198	213	231	264	290	322	354	1.0	1.0	2.5	6.5	2.4	1.0	.2	.0	18,892	139.5	67.1	9,360	<-76	.025	.617	8.0
Average 26 samples	0.21	1.34	108	131	3.75	110	135	148	158	166	181	195	206	222	245	267	309	354	0.9	0.9	2.3	6.6	0.9	0.9	0.0	0.0	18,927	144.6	68.6	9,920	<-76	0.015	0.617	6.6
Military aviation gasolines																																		
67	0.05	1.36	102	131	4.56	104	132	146	153	160	176	192	208	228	263	288	320	354	1.0	1.0	2.1	6.0	2.8	0.7	0.1	0.0	18,780	123.4	64.6	7,972	<-76	0.035	0.59	7.7
68	.32	1.31	111	130	4.56	112	124	146	155	164	182	198	208	222	234	255	286	354	.8	1.2	3.1	6.6	1.4	1.6	.4	.0	19,014	160.0	72.6	11,616	<-76	.02	.620	7.8
69	.15	1.28	106	130	4.60	104	124	142	150	157	177	193	205	"24	257	283	308	347	1.0	1.0	2.6	6.8	-	1.3	<.5	.0	2/18,925	137	67.8	9,289	<-76	.029	-	8.4
70	.13	1.28	105	130	4.6	110	128	141	148	155	168	178	190	211	245	268	315	331	1.0	.5	2.0	6.9	1.5	1.0	.2	.0	19,021	164	72.2	11,841	<-76	.03	-	7
71	.56	1.36	117	131	4.47	110	126	141	153	163	182	197	207	221	253	280	332	348	1.0	1.0	2.7	6.7	.0	1.8	.0	.5	19,015	159	72.8	11,575	<-76	.01	.617	8.0
72	.05	1.28	102	130	4.60	114	132	144	155	162	174	184	195	211	232	256	324	339	1.0	1.0	2.3	6.9	1.0	1.0	.2	.0	18,907	140.2	68.2	9,562	<-80	.02	.62	5.0
73	.19	1.38	107	131	4.36	112	135	153	163	174	190	205	215	228	250	266	314	368	1	1	2.8	6.4	0	.1	.0	.0	2/18,894	154.0	69.9	10,765	<-76	.012	-	6.0
74	.40	1.28	113	130	4.40	104	129	149	163	172	192	205	211	225	239	254	294	360	1.0	1.0	3.4	6.7	.4	.6	.0	.0	19,019	163	72.1	11,752	<-76	.02	-	8.0
75	.00	1.28	100	130	4.50	116	135	141	146	150	159	170	181	199	237	267	310	322	1.0	1.0	1.1	6.6	4	0	.0	.0	18,928	143	68.9	9,853	<-76	.010	.65	6.7
Average 4/ 24 samples	0.19	1.33	107	131	4.05	111	133	147	156	164	179	194	205	222	247	269	312	352	1.0	0.9	2.3	6.6	1.2	0.9	0.1	0.0	18,932	146.0	68.9	10,059	<-76	0.017	0.623	6.9

TABLE 6.- Grade 108/135 aviation gasoline: Inspection data furnished by participating companies for their products, 1955

Item	Knock value: TEL in isooctane, ml./gal.: Lean mixture, ASTM D614	Knock value: TEL in isooctane, ml./gal.: Rich mixture, ASTM D909	Knock value: Performance number: Lean mixture	Knock value: Performance number: Rich mixture	Tetraethyllead, ml./gal.	Distillation, ASTM Method D86: Temperature (corrected to sea level) °F.: Percent evaporated: IBP	5	10	15	20	30	40	50	70	90	95	EP	Sum 10+50	Distillation, ASTM Method D86: Percent Res.	Distillation, ASTM Method D86: Percent Loss	Slope of distillation curve at 10 percent	Reid vapor pressure, ASTM D323, lb.	Copper dish gum, ASTM D910, mg./100 ml.	Potential gum, 16 hr., ASTM D873, mg./100 ml.	Visible lead precipitate, ASTM D873, mg.,/100 ml.	Water tolerance, ASTM D1094, ml.	Net heat of combustion, Btu per lb. 1/	Aniline point, ASTM D611, °F.	Gravity, ASTM D287, ° API	Aniline-gravity constant	Freezing point, FS 141, °F.	Sulfur (uncorrected for TEL), ASTM D90, weight percent	Kinematic viscosity, ASTM D445, at 70° F., centistokes	Inhibitor content, lb. per 1,000 bbl.
Commercial aviation gasolines																																		
76	0.38	1.69	113	135	2.92	114	137	153	165	176	193	206	216	222	252	279	320	369	1.0	1.0	2.8	6.8	-	2	0.0	0.0	19,015	164.2	71.2	11,691	<-76	0.03	0.69	8.4
77	.23	1.70	108	135	2.97	112	135	145	155	160	173	187	198	214	234	249	291	343	1.0	.5	2.0	6.5	1.0	1.2	.0	.0	2/18,988	144	69.4	9,994	<-76	.014	.56	5
78	.29	1.77	110	136	2.83	108	130	143	153	161	178	197	215	233	253	280	327	358	1.0	1.0	2.3	6.8	.4	.8	.0	.0	19,009	157.8	72.4	11,425	<-76	.010	.66	7.2
79	.39	1.86	113	137	2.79	112	130	144	155	165	185	201	214	225	250	270	318	358	1.0	1.0	2.5	6.7	1	1	.0	<1	18,969	152.0	69.7	10,594	<-76	.016	-	3.9
80	.40	1.90	113	137	2.89	110	141	152	160	170	190	206	218	230	247	267	314	370	1.0	1.0	1.9	6.6	1	1	.0	.0	19,031	165.6	72.6	12,023	<-76	.004	.68	7.6

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81	.23	1.73	108	136	2.95	108	136	148	157	164	179	195	209	228	251	275	328	357	1	0	2.1	6.5	2	1	.0	.0	18,871	135.3	66.7	9,025	<-76	.01	.69	6.7
82 3/	.25	1.70	109	135	2.90	106	132	147	159	167	189	207	219	233	253	267	290	366	1	1	2.7	6.6	1	1	.0	.0	18,897	139.1	67.5	9,389	<-76	.01	.603	7.2
83 3/	.26	1.90	109	137	2.94	105	134	147	156	165	185	205	216	229	250	282	330	363	.9	.9	2.2	7.0	.9	.6	.0	.0	2/18,912	150	69.0	10,350	<-76	.011	.609	7.1
84 3/	.42	1.69	114	135	2.81	106	131	146	158	169	188	203	217	228	247	263	320	363	1	1	2.7	6.6	1	.6	.0	.0	2/19,078	162.0	71.9	11,648	<-76	.015	-	5.6
Average	0.32	1.77	111	136	2.89	109	134	147	158	166	184	201	214	227	249	268	315	361	1.0	0.8	2.4	6.7	1.0	1.0	0.0	0.0	18,974	152.2	70.0	10,654	<-76	0.013	0.642	6.5
9 samples																																		

Military aviation gasolines

Average 4/	0.31	1.76	111	136	2.88	106	132	147	158	167	187	205	217	230	250	271	313	364	1.0	1.0	2.6	6.7	1.0	0.7	0.0	0.0	18,962	150.4	69.5	10,453	<-76	0.012	0.606	6.6
3 samples																																		

TABLE 7.- Grade 115/145 aviation gasoline: Inspection data furnished by participating companies for their products, 1955

Commercial aviation gasolines

85	0.51	2.92	116	146	4.50	113	128	143	154	163	176	187	197	216	242	273	332	340	1.0	1.0	2.6	6.7	1.0	1.0	0.0	0.0	19,004	158.2	71.8	11,359	<-80	0.02	0.74	5.0
86	.93	3.00	124	147	4.6	107	136	155	167	177	196	209	217	228	243	261	310	372	.4	1.1	3.1	5.7	1	1	.0	.0	19,021	164	71.6	11,742	<-76	.009	.68	7.7
87 3/	.77	3.05	122	147	4.50	106	137	158	169	180	202	214	220	229	242	255	302	378	1.0	1.0	3.2	6.6	1	0	.0	.0	18,993	157.5	70.0	11,025	<-76	.002	-	7.6
88 3/	.80	3.00	122	147	4.35	114	146	156	166	175	194	210	218	229	246	274	320	374	1.0	1.0	2.0	6.3	1	1	.0	.0	19,027	165.7	71.8	11,897	<-76	.004	.69	7.6
89 3/	1.0	2.82	126	145	4.44	106	139	158	170	182	200	211	217	228	243	263	302	375	1.0	1.0	3.1	5.8	1	0	.0	.0	18,983	158	68.8	10,870	<-76	.014	.67	7.5
90 3/	.70	2.83	120	145	4.57	115	142	157	168	179	194	206	217	220	246	274	307	374	1.0	1.0	2.6	6.6	-	2	.0	.0	19,016	164.4	71.1	11,689	<-76	.03	.69	8.4
91 3/	.98	3.31	125	149	4.47	114	136	158	173	183	200	211	218	230	250	271	334	376	1.0	1.0	3.7	6.0	-	.0	.0	.0	2/19,103	164.5	70.5	11,597	<100	.009	.656	7.2
92 3/	.53	2.78	117	145	4.45	104	131	144	155	166	187	204	216	229	245	256	287	360	1	1	2.4	6.7	1	1	.0	.0	18,950	147.8	69.1	10,213	<-76	.01	.619	7.2
93 3/	.58	2.94	118	146	4.58	106	129	143	153	161	179	198	213	231	256	278	326	356	1	1	2.4	6.8	1	1	.0	.0	18,954	148.6	69.2	10,283	<-76	.01	.69	6.7
94 3/	.50	3.0	116	147	4.55	110	133	146	156	165	187	205	217	230	253	284	328	363	1.0	1.0	2.3	6.9	.8	.6	.0	.0	18,920	150	69.5	10,425	<-76	.018	.609	7.6
95 3/	.50	3.00	116	147	4.48	108	142	154	167	176	194	206	214	225	244	276	332	368	1.0	1.0	2.5	6.6	1.0	.5	.0	.0	19,007	161.6	70.5	11,393	<-76	.010	.67	5.5
96 3/	.65	2.86	119	146	4.52	105	131	145	156	167	186	204	216	228	246	259	320	361	1	1	2.5	6.3	0	.8	.5	.0	2/19,071	159.0	71.4	11,353	<-76	.018	-	5.7
97 3/	.90	2.78	124	145	4.58	109	139	147	153	159	173	186	196	208	220	229	256	343	1.0	1.0	1.4	6.7	1.0	.6	.0	<1.0	19,033	163.3	74.5	12,166	<-80	.016	.58	6.8
98 3/	.90	2.78	124	145	4.46	114	136	148	155	162	180	198	211	227	250	266	332	359	1.0	.0	1.9	6.8	1	1	.0	.0	2/18,950	155	70.7	10,959	<-76	.013	.62	4.0
99 3/	.79	2.92	122	146	4.45	108	126	145	155	162	185	201	214	226	249	270	318	359	1.0	1.0	2.9	6.5	1	1	.0	<1	18,976	154.0	69.8	10,749	<-76	.020	-	7.3
100 3/	.52	2.92	116	146	4.50	119	139	155	167	177	192	202	211	226	244	266	324	366	1	1	2.8	6.8	2	1	.0	.0	18,949	149.0	68.9	10,266	<-76	.03	.61	4.5
101 3/	.47	2.78	115	145	4.59	104	127	139	148	153	173	190	199	214	232	246	293	338	1.0	.5	2.1	6.9	.6	.7	.0	.0	2/18,988	145	69.1	10,020	<-76	.011	.57	5
Average	0.71	2.92	120	146	4.51	110	135	150	161	170	188	202	212	225	244	265	313	362	1.0	0.9	2.6	6.5	1.0	0.8	0.0	0.0	18,997	156.8	70.5	11,054	<-76	0.014	0.650	6.5

Military aviation gasolines

102	0.82	2.81	123	145	4.56	114	129	139	144	148	157	168	179	205	234	268	314	318	0.5	0.5	1.5	6.8	0.6	1.0	0.2	0.0	18,982	149.5	72.5	10,839	<-76	0.014	0.53	8.4
103	1.00	2.86	126	146	4.52	100	129	139	148	154	169	187	200	216	233	247	270	339	1.0	1.0	1.9	6.9	1.0	1.0	.0	.0	19,035	163.6	74.5	12,188	<-76	.01	.661	8.3
104	.79	3.06	122	147	4.10	114	142	159	175	184	199	212	218	226	239	256	296	377	1.0	1.0	3.3	6.5	1	2	.0	.0	19,008	161.2	70.7	11,397	<-76	.008	-	8.0
105	.47	2.78	115	145	4.56	114	132	146	157	165	177	187	199	214	240	272	330	345	1.0	1.0	2.5	6.6	1.0	1.0	.1	.0	18,994	156.7	71.0	11,126	<-80	.02	.75	5.0
106	.48	2.84	115	145	4.57	111	128	146	157	167	186	201	215	229	251	279	322	361	1.0	1.0	2.9	6.6	1.3	.9	.0	.5	18,968	152.0	70.0	10,640	<-76	.04	.613	8.0
107	.74	2.78	121	145	4.53	108	134	153	165	176	194	205	211	219	250	280	326	364	1.0	1.0	3.1	6.6	.5	1.6	.0	.5	18,949	149.0	68.5	10,207	<-76	.01	.616	8.0
108	.51	2.79	116	145	4.60	107	128	138	146	154	175	196	211	223	235	251	298	349	1.0	1.0	1.8	7.0	1	2.9	.1	.0	18,944	146.7	69.1	10,137	<-76	.012	-	6.1
109	.71	2.86	120	146	4.51	102	135	148	158	168	186	202	213	223	242	265	326	361	1.0	1.0	2.3	6.6	<1.0	.6	.0	.0	19,021	164.2	71.6	11,757	<-76	.01	-	8.4
110	.50	2.95	116	146	4.56	105	132	143	152	161	183	202	215	232	252	258	329	358	1.0	1.0	2.0	6.7	.8	.4	.0	.0	19,011	159.8	72.0	11,506	<-76	.013	.61	6.7
111	.8	2.82	122	145	4.57	112	128	152	158	170	192	208	216	224	236	253	288	368	.9	1.1	3.0	6.4	1.2	1.4	.4	.0	19,027	166.0	72.2	11,985	<-76	.018	.628	7.8
112	.56	2.84	117	145	4.56	100	124	139	150	158	178	198	213	230	262	290	324	352	1.0	1.0	2.6	6.2	2.5	1.0	.2	.0	18,955	150.0	69.0	10,350	<-76	.025	.620	8.0
113	.59	2.78	118	145	4.54	102	134	148	157	166	182	192	208	219	234	250	292	356	1.0	1.0	2.3	6.0	1.3	1.3	.0	.0	18,964	150.3	70.2	10,551	<-76	.033	.59	8.2
114	.51	2.78	116	145	4.53	112	135	146	155	163	178	194	205	219	236	248	286	351	1.0	1.0	2.0	6.2	4	0	.0	.0	19,014	160	72.2	11,552	<-76	.010	.65	6.7
115	.48	2.78	115	145	4.60	114	129	144	153	161	180	198	213	233	262	288	315	357	1.0	1.0	2.4	6.6	-	<.5	<.5	.0	2/18,905	143	68.3	9,767	<-76	.02	-	8.4
116	.58	3.09	118	147	4.50	108	133	154	170	181	195	207	215	222	241	264	308	369	1.0	.5	3.7	6.7	.1	2.5	.3	.0	18,951	148.6	68.9	10,239	<-76	.01	-	7
Average 4/	0.67	2.89	120	146	4.51	109	134	148	159	167	185	200	211	224	244	265	310	359	1.0	0.9	2.5	6.6	1.1	1.0	0.1	0.0	18,988	155.5	70.5	10,963	<-76	0.016	0.634	7.1
30 samples																																		

1/ Unless otherwise indicated, the figures for net heat of combustion are computed from the formula developed by the National Bureau of Standards in cooperation with the American Society for Testing Materials: $Q = 17,608 + 0.2054(AG) - 7.24(10^{-6})(AG)^2$ for sulfur-free gasoline, where AG is the aniline-gravity constant. Corrected for sulfur content by the formula: $Q' = Q[1 - 0.01 (\text{percent } S)] + 43.7 (\text{percent } S)$.

2/ Determined value: ASTM D240-50, a company modified method, FS 2501.2, or FS 2502.3. 3/ Fuel for commercial and military use.

4/ The samples represented include those tabulated with commercial fuels which are indicated by footnote 3 in the same grade.

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TABLE 8.- Aviation jet fuels: Inspection test data furnished by participating companies on their products, 1955 1/

Item 2/	Gravity ASTM D287, ° API	Distillation, ASTM Method D86: Temperature range, ° F. (corrected to sea level) IBP	Percent evaporated 10	20	50	90	EP	400 ° F. point % evap.	Percent Res.	Loss	Reid vapor pressure, ASTM D323, lb.	Tag closed tes flash point, ASTM D56, ° F.	Freezing point, FS 1411, 3 ° F.	Color, Saybolt, ASTM D156	Kinematic viscosity, ASTM D445, centistokes at -30° F.	Water tolerance, ASTM D1094, ml.	Aniline point, ASTM D611, ° F.	Aniline-gravity constant	Bromine number, ASTM D875, D1158, D1159, gm. lb. per 100 gm.	Total sulfur, ASTM D90, weight percent	Mercaptan sulfur, FS 5204 or equivalent, weight percent	Aromatic content ASTM D875, volume percent	Olefins, ASTM D875, volume percent	Smoke point, FS 2107, ASTM D1322	Smoke volatility index 3/	Gum, mg. per 100 ml.: Existent gum, ASTM D381 Steam jet 450 F.	16 hour accelerated, ASTM D873 Steam jet 450 F.	Net heat of combustion, Btu per lb. 4/	Hydrogen-carbon ratio, ASTM D1018 or equivalent
Grade JP-3 (MIL-F-5624C)																													
117	55.3	115	142	157	220	445	555	71	1.0	1.0	6.3	<-32	<-76	23	1.8	0.0	127.5	7,051	0.4	0.04	0.001	9.0	0.6	26	55.8	1	1	5/ 18,700	0.16
118	58.9	108	150	179	261	413	512	86	1.3	1.3	5.5	-	<-76	27	-	.0	135.0	7,952	1.2	.08	.003	9.7	.6	29	65.1	6/ .2	6/1.2	18,773	.175
2 samples																													
Grade JP-4 (MIL-F-5624C)																													
119	51.7	118	190	238	313	438	524	82	1.4	1.4	2.7	-	<-76	27	-	0.0	128.5	6,643	0.4	0.05	0.004	16.7	0.3	27	61.4	6/0.6	6/1.8	18,645	0.167
120	54.2	157	195	215	276	453	515	82	1.0	1.0	2.6	-	<-76	29	-	.0	133.1	7,214	1.2	.04	.001	9.1	.7	28	62.4	1	2	18,708	-
121 7/	48.3	142	214	260	335	409	452	85	1.0	1.0	2.8	-20	<-80	22	4.3	<1.0	131	6,327	2.6	.25	.0004	11.0	2.3	23	58.7	1.0	1.5	18,582	.1590
122	45.2	-	246	270	330	438	490	77.0	1.0	1.0	2.5	-	<-76	4	-	<1	120.0	5,424	2.63	.20	.0015	11.8	3.7	22.0	54.3	2.6	5.5	18,481	-
123	52.7	142	209	238	320	438	480	76.5	1.0	1.0	2.6	-	-82	19	-	.0	139.1	7,331	1.4	.035	.0008	10.8	1.2	30.5	62.6	1.0	1.7	18,720	-
124 8/	51.9	126	185	228	333	443	496	71.3	.8	.7	3.0	-	<-76	15	-	.0	138	7,162	1	.061	.000	13	1	33	62.9	1	4	18,699	-
125	48.2	126	203	249	346	445	486	71.0	1.0	1.0	2.7	<80	<-76	18	3.0	.0	128.5	6,194	1.0	.09	.0042	15.3	.0	25	54.8	1.0	1.0	18,589	-
126	53.0	140	185	205	283	447	498	81.5	1.0	1.0	2.6	< 0	<-76	28	2.48	.0	131.0	6,943	5	.019	.0003	13	1	27.0	61.2	1	1	18,682	.160
127	52.9	158	214	249	322	412	485	87.0	1.0	.0	2.4	-	<-90	15	2.8	.0	135.7	7,179	1.38	.084	.0016	11.8	1.29	31	67.5	.2	5.5	5/ 18,441	-
128	53.7	138	180	246	310	390	430	93.5	1.0	1.0	2.6	<33	<-76	21	2.81	.0	136.6	7,335	0	.018	.0005	8.3	1.3	29.0	68.3	.2	.6	18,721	.168
129	50.5	140	230	264	323	417	502	85.0	1.0	1.0	2.3	-	<-76	-	-	<1.0	129.9	6,560	-	.126	.003	15.3	1.0	20.5	56.2	1.8	7.1	18,626	-
130	48.3	146	232	280	342	403	488	89	1.0	1.0	2.6	<70	-77	0	3.44	.5	130.0	6,279	3.3	.110	.0008	17.5	.9	31.0	68.4	1.4	6.6	18,596	-
131	52.8	134	217	243	280	399	488	90	1.2	.8	2.9	<70	-100	30	2.55	<1.0	130.3	6,880	.4	.016	.0021	11.7	.3	31.0	68.8	.0	.6	18,677	-
132	55.9	146	233	259	321	420	492	84	1.0	1.0	2.8	-	-82	-	-	.0	144	8,050	1.57	.035	.0004	7.6o	1.32	35	70.3	1.8	2.5	5/ 18,780	-
133	54.2	145	244	262	294	354	414	97.5	1.0	.5	2.8	-	<-80	-	-	.0	133.7	7,247	1.70	.033	.0004	9.0	.93	35	76.0	.9	2.3	18,711	-
134	52.9	130	206	252	333	423	497	86.0	1.0	1.0	2.5	<60	-98	25	2.81	.0	141	7,459	.85	.03	.0056	5.9	1.0	28	64.1	.2	.5	18,778	.168
135	51.3	129	221	270	350	432	470	78	1.0	1.0	2.9	-	<-76	30	-	.0	140.7	7,218	.8	.07	.001	8.5	1.1	32	64.8	.1	.2	18,704	-
136	47.7	148	204	232	364	443	482	65.5	1.0	.0	2.8	-	<-76	30	3.5	.0	130.9	6,244	.6	.07	.001	8.2	.6	27	54.5	.0	1	18,598	.159
137	55.8	167	258	274	307	388	476	93	1.0	1.0	2.7	-	-92	26	2.62	.0	143.5	8,007	1.2	.051	.001	7.4	1.2	40	79	.6	1.5	18,781	.168
138	51.6	141	226	264	336	426	474	80	1.0	1.0	2.5	-	<-76	26	3.22	.0	139	7,172	1.46	.020	.001	9.8	1.03	33	67	.4	.9	18,706	.166
139	54.6	139	220	257	313	377	415	97	.9	.6	2.8	-	<-76	20	2.27	.0	130	7,098	1.5	.076	.001	15.2	1.25	30	71	.1	.2	18,690	.163
140	55.1	142	255	266	284	338	378	100	1.0	1.0	2.6	-	-110	27	2.28	.0	132.8	7,317	.9	.081	.0005	9.3	.6	29.8	71.8	.0	1.6	18,712	.170
141	52.9	127	231	269	325	396	459	92	1.3	.7	2.3	14	<-76	14	3.28	.0	138.9	7,348	10	.025	.0002	11.2	.9	34	72.6	1.8	1.6	5/ 18,512	-
142	52.6	132	218	256	322	424	486	82	.9	.0	2.3	-	-80	21	-	.0	135.0	7,101	1.24	.094	.000	12.3	1.1	31	65.4	.2	2.8	18,688	.170
143	50.3	138	205	251	348	422	478	81.0	1.0	1.0	2.6	-	-94	4	3.2	.0	139	6,992	.6	.03	.002	8	1	27	61	1	3	18,686	-
144	52.5	140	210	250	315	420	468	84	1.0	1.0	2.7	-	<-76	25	-	.0	137	7,193	1.1	.05	.001	10.5	.7	35	70.3	.2	2.0	18,704	.132
145	53.3	142	232	254	302	386	434	93	1.0	1.0	2.4	-	<-76	18	-	.0	141	7,515	2.02	.044	.001	11.39	1.61	31.7	70.8	1.6	2.6	18,737	.139
146	54.9	186	243	256	281	332	437	96	.5	.5	2.4	-	<-76	28	-	.5	139	7,631	1.8	.04	.001	5.3	4.0	36	76.3	1.4	4.8	18,748	.163
147	56.6	150	218	248	305	407	486	86	1.1	.9	2.4	-	-80	16	2.9	.0	148	8,377	3.3	.045	.001	8 5	2.3	35.0	71.1	1.9	3.2	18,815	.110
148 7/	51.3	137	250	280	332	430	493	82	1.0	1.0	2.6	-	-84	18	3.05	.0	140	7,182	2.78	.055	.002	11.78	2.39	30.0	64.4	.6	3.0	18,702	.140
Average	52.2	142	219	253	318	412	472	85	1.0	0.8	2.6	-	<-76	-	2.97	0.0	135.5	7,073	1.51	0.065	0.0013	10.8	1.3	30.3	66.0	0.9	2.4	18,674	0.156
30 samples																													
Grade JP-4 referee fuel (MIL-F-5161C, Amendment 1)																													
149	48.0	144	237	280	353	462	515	73.0	1.0	1.0	2.5	-	<-67	-	-	<1.0	132.4	6,355	-	0.196	0.001	17.25	0.87	22	52.7	0.6	7.8	18,593	-
150 8/	48.3	154	219	261	359	471	514	67	1.0	1.0	2.5	-	-74	22	-	.0	132.4	6,395	1.5	.23	.001	13.9	.8	23	51.1	1	4	18,537	-
151	49.0	138	232	284	360	474	518	66.7	1.3	.7	2.4	-	-69	20	-	.0	140.0	6,860	1.3	.17	.001	11.5	1.1	25.0	53.0	1.5	5.0	18,652	0.137
Average	48.4	145	229	275	357	469	516	68.9	1.1	0.9	2.5	-	<-67	-	-	0.0	134.9	6,529	1.4	0.199	0.001	14.2	0.9	23.3	52.2	1.0	5.6	18,613	-
3 samples																													
Grade JP-5 (MIL-F-5624C)																													
152	37.5	-	389	399	426	474	520	21.0	1.0	1.0	-	9/140	-58	11	12.05	<1	134.3	5,044	4.8	0.26	0.0007	13.2	6.5	20	28.8	1.0	1.2	18,423	-
153	39.5	368	390	402	430	490	530	19.0	1.0	.0	0	144	<-40	22	14.7	.0	147	5,807	2.7	.19	.001	13.1	.7	23	31.0	.0	1	18,530	0.160
154 7/	42.3	370	398	409	428	490	535	11	1.0	.0	-	148	-46	26	12.85	.0	152	6,430	1.80	.051	.002	9.75	2.0	23.0	27.6	1.6	2.6	18,622	.135
Average	39.8	369	392	403	428	485	528	17.0	1.0	0.3	-	-	<-40	-	13.20	0.0	144.4	5,747	3.10	0.167	0.0012	12.0	3.1	22.0	29.1	0.9	1.6	18,525	0.148
3 samples																													

1/ All the samples were reported, respectively, 0 or 1 to copper-strip corrosion (air-wall method) by ASTM D130-53T or ASTM D130-54T, or their equivalents.
2/ Unless otherwise indicated, the fuels represented were manufactured for military use only.
3/ Smoke volatility index is computed: S.V.I. = S.P. (smoke point) + (0.42 x volume percent boiling under 400 ° F.), MIL-F-5624C, 18 May 1955, p. 2, Par. 3, 2, 4.
4/ Unless otherwise indicated, the figures for net heat of combustion are computed from the formula developed by the National Bureau of Standards in cooperation with the American Society for Testing Materials: $Q = 17,608 + 0.2054(AG) - 7.24(10^{-6})(AG)^2$ for sulfur-free fuel, where AG is the aniline-gravity constant. Corrected for sulfur content by the formula: $Q' = Q[1 - 0.01 \text{ (percent S)}] + 43.7 \text{ (percent S)}$.
5/ Determined value: ASTM D240-50(FS 2501), FS 2502, or company modification. 6/ Gum by air jet at 400° F., not included in average. 7/ Fuel for commercial and military use.
8/ Fuel for commercial use. 9/ Flash point by Pensky-Martens closed tester, ASTM D93-52.

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TABLE 9.- Summarized data on grade 80/87 commercial aviation gasoline

Inspection test	1947	1948	1949	1950	1951	1952	1953	1954	1955
Number of fuels	36	37	37	17	18	16	18	17	19
Octane number:									
Lean mixture	80.5	80.5	80.8	81.1	80.8	81.7	81.8	81.8	82.2
Rich mixture	-	-	87.6	87.8	87.6	87.7	87.7	87.9	88.4
Tetraethyllead - ml./gal.	None	0.14	0.16	0.19	0.25	0.53	0.52	0.43	0.44
Color	Clear 1/	Clear 2/	Clear 3/	Clear 4/	Clear 5/	Red 6/	Red 6/	Red 7/	Red 7/
Distillation temp.:									
10% evap. - ° F.	150	147	148	145	147	147	148	147	148
50% evap.	197	192	194	194	191	191	191	192	194
90% evap.	240	236	236	239	238	236	237	234	237
Sum 10 + 50	347	339	342	339	338	338	339	339	342
Slope at 10 per cent	1.8	1.7	1.6	1.9	1.7	1.7	1.6	1.7	1.9
Reid vapor pressure - lb.	6.4	6.4	6.2	6.6	6.5	6.5	6.4	6.5	6.4
Gum:									
Copper dish - mg./100 ml.	1.2	1.1	1.1	.8	1.2	1.2	1.2	1.4	.9
Potential, 16 hr.	-	-	-	1.0	1.1	1.3	1.2	1.2	1.1
Heat of combustion, net - Btu/lb.	19,175	19,180	19,170	18,994	18,989	18,969	18,952	18,880	18,881
Aniline point - ° F.	145.5	142.5	142.3	141.2	140.5	134.2	135.5	135.1	138.4
Gravity - ° API	69.2	69.0	68.8	68.5	68.5	67.7	68.1	67.7	68.3
Aniline-gravity constant	10,069	9,833	9,790	9,689	9,648	9,103	9,228	9,146	9,453
Freezing point - ° F.	<-76	<-76	<-76	<-76	<-76	<-76	<-76	<-76	<-76
Corrosion, copper strip	Neg.	Neg.	Neg.	Neg.	Neg.	Neg.	Neg.	Neg.	No. 1
Sulfur - wt. percent	0.017	0.015	0.015	0.015	0.014	0.015	0.015	0.015	0.013
Viscosity, kinematic at 70° F. - cs.	.604	.593	.604	.623	.615	.611	.609	.619	.604

TABLE 10.- Summarized data on grade 91/96 commercial aviation gasoline

Inspection test	1947	1948	1949	1950	1951	1952	1953	1954	1955
Number of fuels	41	37	36	15	15	15	18	19	21
Octane number:									
Lean mixture	93.1	93.1	93.1	92.6	93.1	93.0	92.5	93.3	94.2
Rich mixture	98.8	98.8	98.7	99.0	98.8	98.7	98.4	98.6	98.7
Tetraethyllead - ml./gal.	2.78	3.23	3.49	3.53	3.51	3.99	3.96	3.78	3.65
Color	Blue	Blue	Blue	Blue	Blue	Blue	Blue	Blue	Blue
Distillation temp.:									
10% evap. - ° F.	149	147	149	148	147	147	148	147	148
50% evap.	198	193	193	192	189	193	192	192	193
90% evap.	240	234	235	235	228	236	236	233	237
Sum 10 + 50	347	340	342	340	337	340	340	339	341
Slope at 10 percent	1.9	1.7	1.6	1.9	1.7	1.7	1.8	1.7	1.8
Reid vapor pressure - lb.	6.4	6.5	6.4	6.5	6.6	6.6	6.6	6.4	6.4
Gum:									
Copper dish - mg./100 ml.	1.7	1.3	1.3	.7	1.0	1.1	.8	1.0	1.0
Potential, 16 hr.	-	-	-	1.0	.9	.9	.9	1.1	.8
Heat of combustion, net - Btu/lb.	19,130	19,112	19,089	18,953	18,958	18,916	19,040	18,878	18,876
Aniline point - ° F.	140.0	137.4	136.3	136.0	136.6	133.2	134.8	135.1	136.5
Gravity - ° API	67.7	67.5	67.1	66.9	67.7	66.8	67.3	67.4	67.4
Aniline-gravity constant	9,478	9,275	9,146	9,113	9,255	8,906	9,072	9,106	9,200
Freezing point - ° F.	<-76	<-76	<-76	<-76	<-76	<-76	<-76	<-76	<-76
Corrosion, copper strip	Neg.	Neg.	Neg.	Neg.	Neg.	Neg.	Neg.	Neg.	No. 1
Sulfur - wt. percent	0.018	0.018	0.018	0.016	0.015	0.018	0.019	0.019	0.016
Viscosity, kinematic at 70° F. - cs.	.606	.591	.601	.615	.609	.619	.616	.608	.602

1/ Three samples blue. 2/ Nine samples red, four blue. 3/ Nine samples red, three blue. 4/ Seven samples red.
5/ Eight samples red, two blue. 6/ Two samples blue. 7/ One sample clear.

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TABLE 11.- Summarized data on grade 100/130 commercial aviation gasoline

Inspection test	1947	1948	1949	1950	1951	1952	1953	1954	1955
Number of fuels	42	43	40	16	16	16	21	21	26
Octane number:									
Lean mixture	Iso+ 0.16	Iso+ 0.13	Iso+ 0.13	Iso+ 0.16	Iso+ 0.19	Iso+ 0.16	Iso+ 0.15	Iso+ 0.19	Iso+ 0.21
Rich mixture	Iso+ 1.36	Iso+ 1.36	Iso+ 1.36	Iso+ 1.36	Iso+ 1.31	Iso+ 1.36	Iso+ 1.35	Iso+ 1.35	Iso+ 1.34
Performance number:									
Lean mixture	106	105	105	106	107	106	106	107	108
Rich mixture	131	131	131	131	130	131	131	131	131
Tetraethyllead ml./gal.	3.44	3.65	3.81	3.46	3.52	4.05	4.05	3.81	3.75
Color	Green	Green	Green	Green	Green	Green	Green	Green	Green
Distillation temp.:									
10% evap. ° F.	151	148	147	147	147	149	148	146	148
50% evap.	207	202	203	206	205	204	204	204	206
90% evap.	246	245	244	244	245	245	246	245	245
Sum 10 + 50	358	350	350	352	351	353	352	350	354
Slope at 10 percent	2.3	2.1	1.9	2.2	2.0	2.0	2.1	2.1	2.3
Reid vapor pressure lb.	6.3	6.4	6.5	6.5	6.7	6.6	6.6	6.6	6.6
Gum:									
Copper dish mg./100 ml.	1.5	1.4	1.2	1.0	1.4	.9	1.0	1.2	.9
Potential, 16 hr.	-	-	-	.8	1.1	1.1	1.1	1.1	.9
Heat of combustion, net Btu/lb.	19,200	19,132	19,130	19,034	19,046	19,022	19,009	18,941	18,927
Aniline point ° F.	153.0	148.2	144.9	152.5	152.7	149.0	146.2	146.7	144.6
Gravity ° API	69.9	69.3	68.5	70.4	70.2	69.5	69.2	69.3	68.6
Aniline-gravity constant	10,695	10,270	9,926	10,757	10,740	10,385	10,117	10,166	9,920
Freezing point ° F.	<-76	<-76	<-76	<-76	<-76	<-76	<-76	<-76	<-76
Corrosion, copper strip	Neg.	Neg.	Neg.	Neg.	Neg.	Neg.	Neg.	Neg.	No. 1
Sulfur wt. percent	0.018	0.018	0.020	0.015	0.013	0.016	0.018	0.017	0.015
Viscosity, kinematic at 70° F. cs.	.616	.604	.611	.620	.633	.635	.627	.632	.617

TABLE 12.- Summarized data on grade 115/145 commercial aviation gasoline

Inspection test	1947	1948	1949	1950	1951	1952	1953	1954	1955
Number of fuels	19	17	19	6	7	9	12	14	17
Octane number:									
Lean mixture	Iso+ 0.59	Iso+ 0.55	Iso+ 0.59	Iso+ 0.59	Iso+ 0.69	Iso+ 0.58	Iso+ 0.59	Iso+ 0.64	Iso+ 0.71
Rich mixture	Iso+ 3.06	Iso+ 2.92	Iso+ 2.92	Iso+ 2.92	Iso+ 2.93	Iso+ 2.96	Iso+ 2.88	Iso+ 2.92	Iso+ 2.92
Performance number:									
Lean mixture	118	117	118	118	120	118	118	119	120
Rich mixture	147	146	146	146	146	146	146	146	146
Tetraethyllead ml./gal.	4.42	4.52	4.47	4.53	4.52	4.55	4.56	4.51	4.51
Color	Purple	Purple	Purple	Purple	Purple	Purple	Purple	Purple	Purple
Distillation temp.									
10% evap. ° F.	149	150	151	149	147	150	148	147	150
50% evap.	211	210	210	212	211	213	212	212	212
90% evap.	244	247	243	250	247	247	246	245	244
Sum 10 + 50	360	360	361	361	358	363	360	359	362
Slope at 10 percent	2.3	2.3	2.0	2.5	2.5	2.5	2.4	2.5	2.6
Reid vapor pressure lb.	6.4	6.5	6.4	6.5	6.6	6.6	6.5	6.6	6.5
Gum:									
Copper dish mg./100 ml.	1.4	1.2	.9	1.0	1.2	.9	.9	1.0	1.0
Potential, 16 hr.	-	-	-	.9	1.1	1.2	1.1	1.1	.8
Heat of combustion, net Btu/lb.	19,235	19,261	19,182	19,043	19,087	19,042	19,040	18,995	18,997
Aniline point ° F.	156.9	156.0	159.0	159.8	161.6	156.1	153.0	156.8	156.8
Gravity ° API	70.5	70.5	71.1	71.0	71.4	70.3	70.1	70.5	70.5
Aniline-gravity constant	11,061	10,998	11,305	11,354	11,546	10,996	10,725	11,054	11,054
Freezing point ° F.	<-76	<-76	<-76	<-76	<-76	<-76	<-76	<-76	<-76
Corrosion, copper strip	Neg.	Neg.	Neg.	Neg.	Neg.	Neg.	Neg.	Neg.	No. 1
Sulfur wt. percent	0.012	0.020	0.015	0.010	0.011	0.017	0.016	0.017	0.014
Viscosity, kinematic at 70° F. cs.	.615	.612	.624	.647	.638	.661	.637	.633	.650

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TABLE 13.- Summarized data on grade 108/135 commercial aviation gasoline

Inspection test	1952	1953	1954	1955
Number of fuels	5	9	9	9
Octane number:				
Lean mixture	Iso+ 0.28	Iso+ 0.34	Iso+ 0.32	Iso+ 0.32
Rich mixture	Iso+ 1.79	Iso+ 1.76	Iso+ 1.75	Iso+ 1.77
Performance number:				
Lean mixture	110	111	111	111
Rich mixture	136	136	136	136
Tetraethyllead — ml./gal.	2.94	2.99	3.10	2.89
Color	Purple 1/	Purple 1/	Brown 2/	Brown 2/
Distillation temp.:				
10% evap. — ° F.	153	148	146	147
50% evap.	214	212	215	214
90% evap.	248	246	251	249
Sum 10 + 50	367	360	361	361
Slope at 10 percent	2.7	2.4	2.3	2.4
Reid vapor pressure — lb.	6.6	6.6	6.6	6.7
Gum:				
Copper dish — mg./100 ml.	.9	.8	1.4	1.0
Potential, 16 hr.	1.2	.9	1.0	1.0
Heat of combustion, net — Btu/lb.	19,057	19,067	18,980	18,974
Aniline point — ° F.	156.7	158.3	154.2	152.2
Gravity — ° API	70.2	71.3	70.1	70.0
Aniline-gravity constant	11,004	11,287	10,809	10,654
Freezing point — ° F.	<-76	<-76	<-76	<-76
Corrosion, copper strip	Neg.	Neg.	Neg.	No. 1
Sulfur — wt. percent	0.016	0.017	0.017	0.013
Viscosity, kinematic at 70° F. — cs.	.674	.643	.634	.642

1/ One sample brown. 2/ One sample purple.

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TABLE 11.- Summarized data on grade 100/130 commercial aviation gasoline

Inspection test	1947	1948	1949	1950	1951	1952	1953	1954	1955
Number of fuels	42	43	40	16	16	16	21	21	26
Octane number:									
Lean mixture	Iso+ 0.16	Iso+ 0.13	Iso+ 0.13	Iso+ 0.16	Iso+ 0.19	Iso+ 0.16	Iso+ 0.15	Iso+ 0.19	Iso+ 0.21
Rich mixture	Iso+ 1.36	Iso+ 1.36	Iso+ 1.36	Iso+ 1.36	Iso+ 1.31	Iso+ 1.36	Iso+ 1.35	Iso+ 1.35	Iso+ 1.34
Performance number:									
Lean mixture	106	105	105	106	107	106	106	107	108
Rich mixture	131	131	131	131	130	131	131	131	131
Tetraethyllead - ml./gal.	3.44	3.65	3.81	3.46	3.52	4.05	4.05	3.81	3.75
Color	Green	Green	Green	Green	Green	Green	Green	Green	Green
Distillation temp.:									
10% evap. - ° F.	151	148	147	147	147	149	148	146	148
50% evap.	207	202	203	206	205	204	204	204	206
90% evap.	246	245	244	244	245	245	246	245	245
Sum 10 + 50	358	350	350	352	351	353	352	350	354
Slope at 10 percent	2.3	2.1	1.9	2.2	2.0	2.0	2.1	2.1	2.3
Reid vapor pressure - lb.	6.3	6.4	6.5	6.5	6.7	6.6	6.6	6.6	6.6
Gum:									
Copper dish - mg./100 ml.	1.5	1.4	1.2	1.0	1.4	.9	1.0	1.2	.9
Potential, 16 hr.	-	-	-	.8	1.1	1.1	1.1	1.1	.9
Heat of combustion, net - Btu/lb.	19,200	19,132	19,130	19,034	19,046	19,022	19,009	18,941	18,927
Aniline point - ° F.	153.0	148.2	144.9	152.5	152.7	149.0	146.2	146.7	144.6
Gravity - ° API	69.9	69.3	68.5	70.4	70.2	69.5	69.2	69.3	68.6
Aniline-gravity constant	10,695	10,270	9,926	10,757	10,740	10,385	10,117	10,166	9,920
Freezing point - ° F.	<-76	<-76	<-76	<-76	<-76	<-76	<-76	<-76	<-76
Corrosion, copper strip	Neg.	Neg.	Neg.	Neg.	Neg.	Neg.	Neg.	Neg.	No. 1
Sulfur - wt. percent	0.018	0.018	0.020	0.015	0.013	0.016	0.018	0.017	0.015
Viscosity, kinematic at 70° F. - cs.	.616	.604	.611	.620	.633	.635	.627	.632	.617

TABLE 12.- Summarized data on grade 115/145 commercial aviation gasoline

Inspection test	1947	1948	1949	1950	1951	1952	1953	1954	1955
Number of fuels	19	17	19	6	7	9	12	14	17
Octane number:									
Lean mixture	Iso+ 0.59	Iso+ 0.55	Iso+ 0.59	Iso+ 0.59	Iso+ 0.69	Iso+ 0.58	Iso+ 0.59	Iso+ 0.64	Iso+ 0.71
Rich mixture	Iso+ 3.06	Iso+ 2.92	Iso+ 2.92	Iso+ 2.92	Iso+ 2.93	Iso+ 2.96	Iso+ 2.88	Iso+ 2.92	Iso+ 2.92
Performance number:									
Lean mixture	118	117	118	118	120	118	118	119	120
Rich mixture	147	146	146	146	146	146	146	146	146
Tetraethyllead - ml./gal.	4.42	4.52	4.47	4.53	4.52	4.55	4.56	4.51	4.51
Color	Purple	Purple	Purple	Purple	Purple	Purple	Purple	Purple	Purple
Distillation temp.									
10% evap. - ° F.	149	150	151	149	147	150	148	147	150
50% evap.	211	210	210	212	211	213	212	212	212
90% evap.	244	247	243	250	247	247	246	245	244
Sum 10 + 50	360	360	361	361	358	363	360	359	362
Slope at 10 percent	2.3	2.3	2.0	2.5	2.5	2.5	2.4	2.5	2.6
Reid vapor pressure - lb.	6.4	6.5	6.4	6.5	6.6	6.6	6.5	6.6	6.5
Gum:									
Copper dish - mg./100 ml.	1.4	1.2	.9	1.0	1.2	.9	.9	1.0	1.0
Potential, 16 hr.	-	-	-	.9	1.1	1.2	1.1	1.1	.8
Heat of combustion, net - Btu/lb.	19,235	19,261	19,182	19,043	19,087	19,042	19,040	18,995	18,997
Aniline point - ° F.	156.9	156.0	159.0	159.8	161.6	156.1	153.0	156.8	156.8
Gravity - ° API	70.5	70.5	71.1	71.0	71.4	70.3	70.1	70.5	70.5
Aniline-gravity constant	11,061	10,998	11,305	11,354	11,546	10,996	10,725	11,054	11,054
Freezing point - ° F.	<-76	<-76	<-76	<-76	<-76	<-76	<-76	<-76	<-76
Corrosion, copper strip	Neg.	Neg.	Neg.	Neg.	Neg.	Neg.	Neg.	Neg.	No. 1
Sulfur - wt. percent	0.012	0.020	0.015	0.010	0.011	0.017	0.016	0.017	0.014
Viscosity, kinematic at 70° F. - cs.	.615	.612	.624	.647	.638	.621	.637	.633	.650

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TABLE 13.- Summarized data on grade 108/135 commercial aviation gasoline

Inspection test	1952	1953	1954	1955
Number of fuels	5	9	9	9
Octane number:				
Lean mixture	Iso+ 0.28	Iso+ 0.34	Iso+ 0.32	Iso+ 0.32
Rich mixture	Iso+ 1.79	Iso+ 1.76	Iso+ 1.75	Iso+ 1.77
Performance number:				
Lean mixture	110	111	111	111
Rich mixture	136	136	136	136
Tetraethyllead — ml./gal.	2.94	2.99	3.10	2.89
Color	Purple 1/	Purple 1/	Brown 2/	Brown 2/
Distillation temp.:				
10% evap. — ° F.	153	148	146	147
50% evap.	214	212	215	214
90% evap.	248	246	251	249
Sum 10 + 50	367	360	361	361
Slope at 10 percent	2.7	2.4	2.3	2.4
Reid vapor pressure — lb.	6.6	6.6	6.6	6.7
Gum:				
Copper dish — mg./100 ml.	.9	.8	1.4	1.0
Potential, 16 hr.	1.2	.9	1.0	1.0
Heat of combustion, net — Btu/lb.	19,057	19,067	18,980	18,974
Aniline point — ° F.	156.7	158.3	154.2	152.2
Gravity — ° API	70.2	71.3	70.1	70.0
Aniline-gravity constant	11,004	11,287	10,809	10,654
Freezing point — ° F.	<-76	<-76	<-76	<-76
Corrosion, copper strip	Neg.	Neg.	Neg.	No. 1
Sulfur — wt. percent	0.016	0.017	0.017	0.013
Viscosity, kinematic at 70° F. — cs.	.674	.643	.634	.642

1/ One sample brown. 2/ One sample purple.

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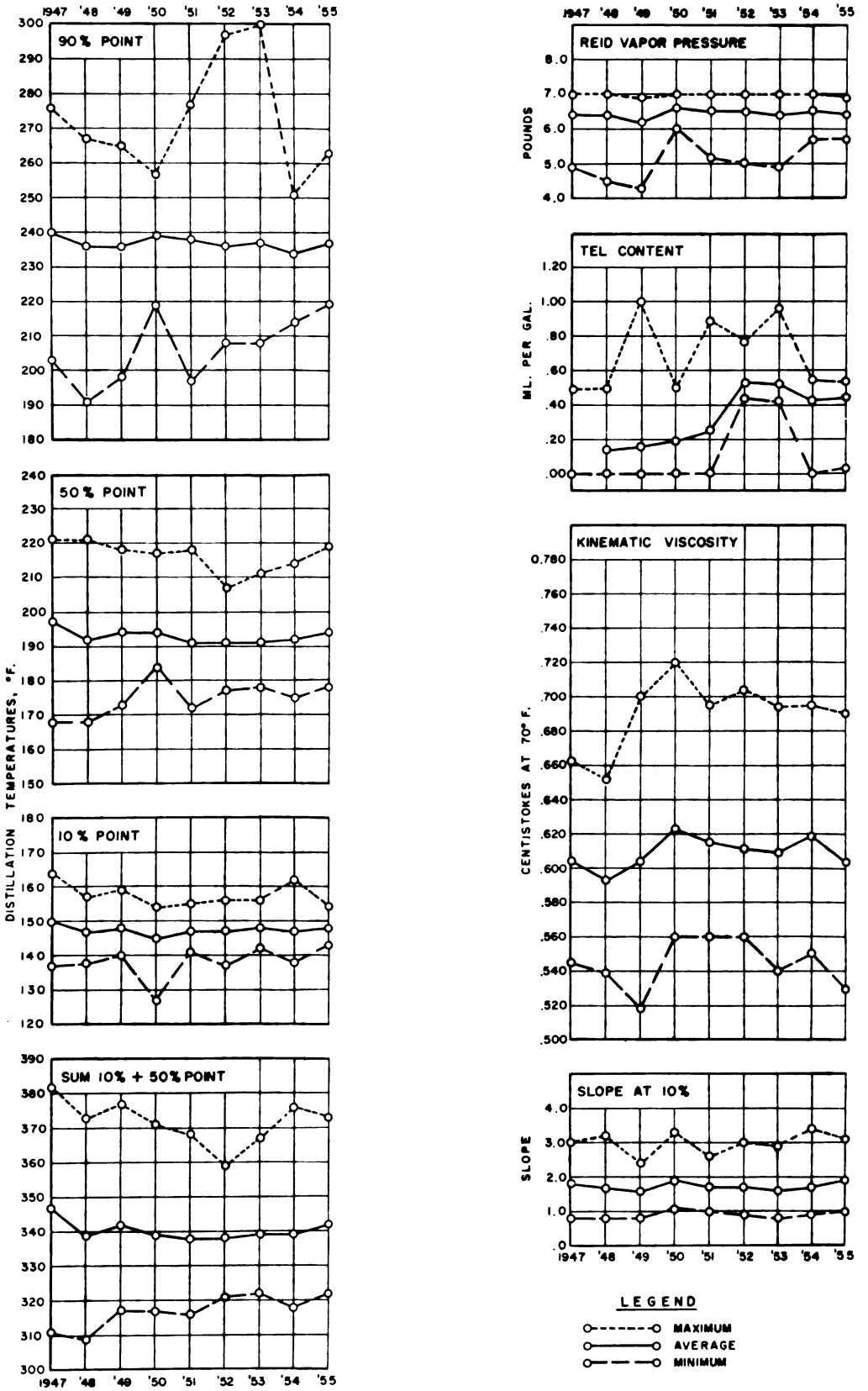

Figure 1. — Trends in grade 80/87 commercial aviation gasolines

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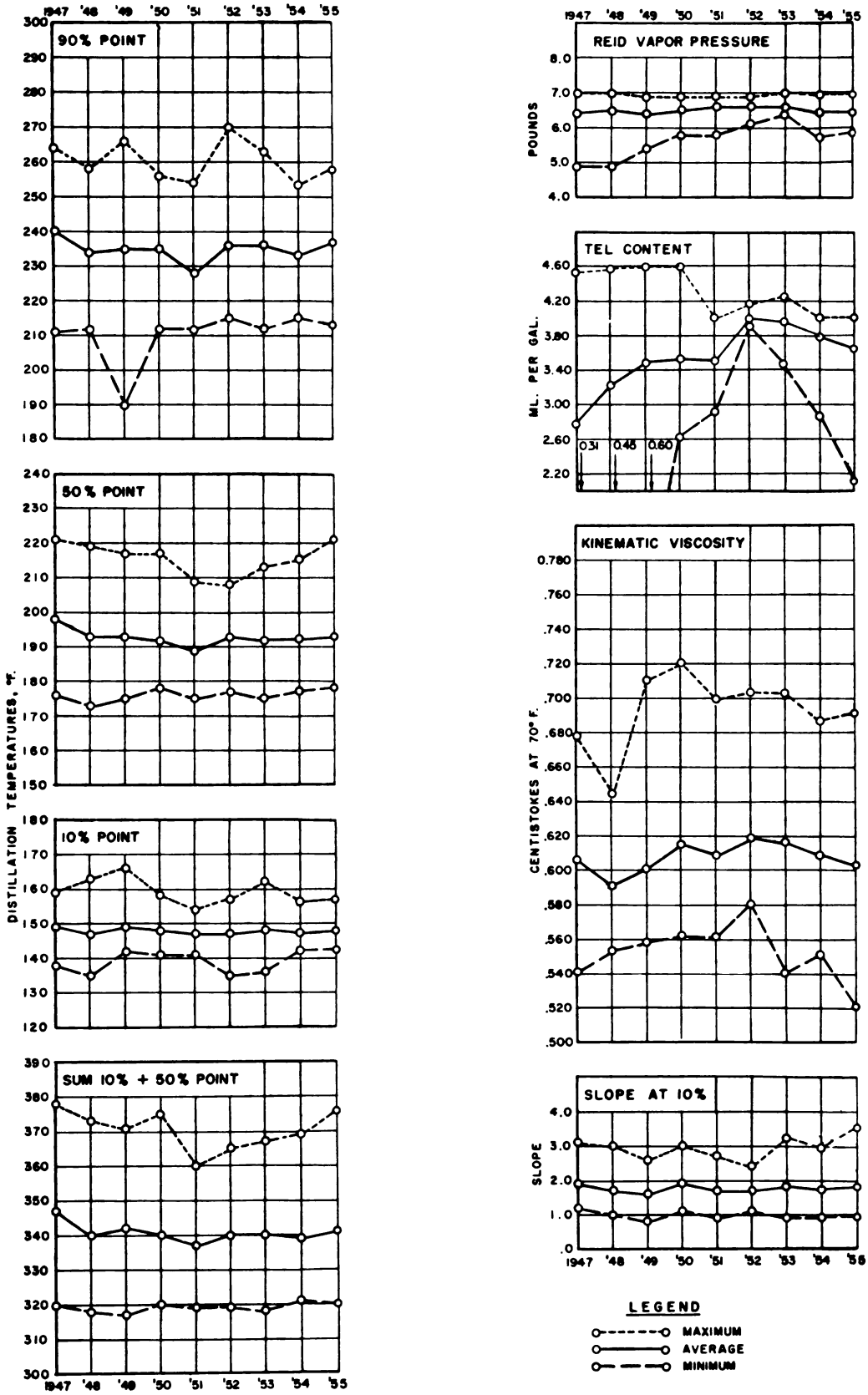

Figure 2.— Trends in grade 91/96 commerical aviation gasolines

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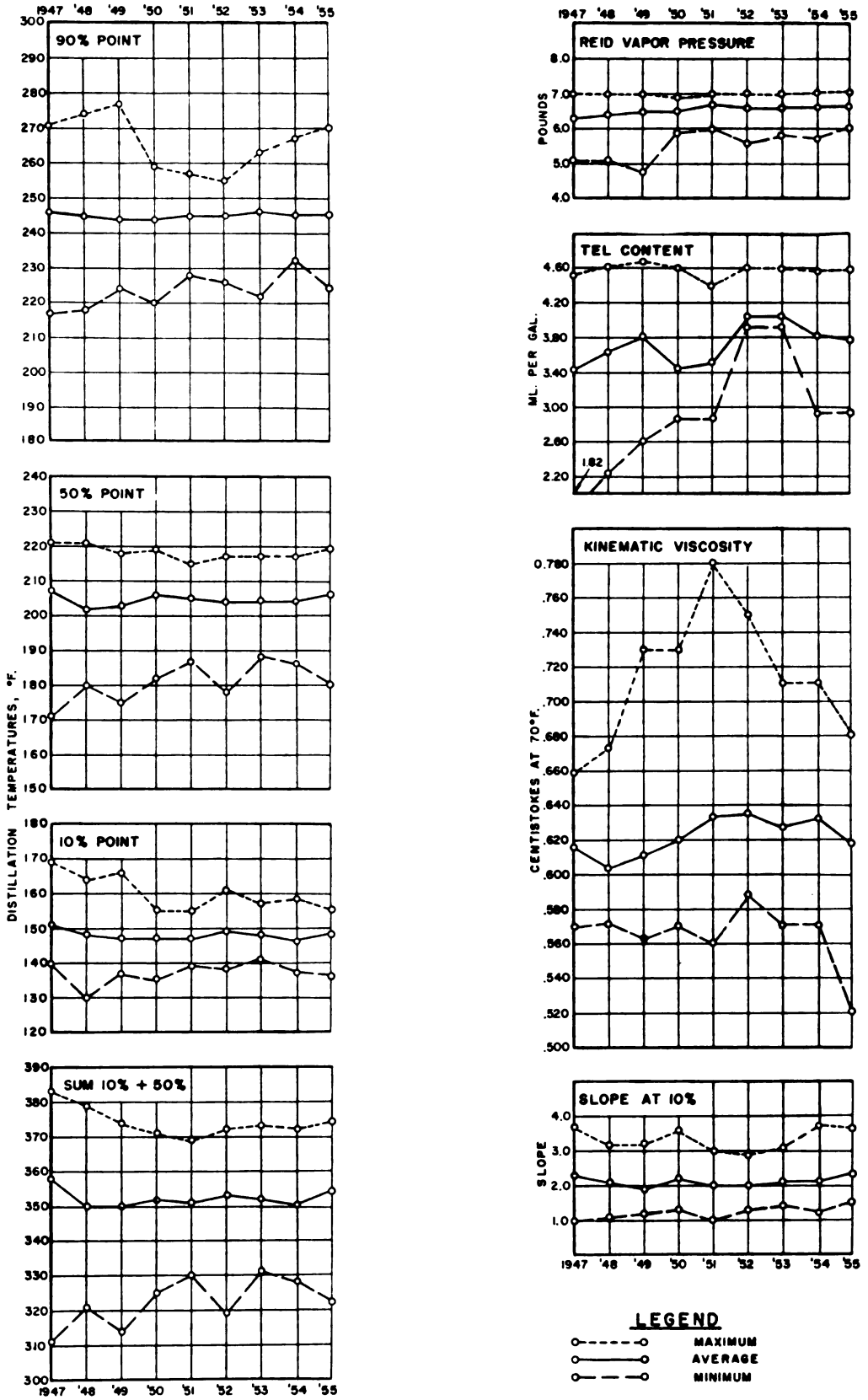

Figure 3.— Trends in grade 100/130 commerical aviation gasolines

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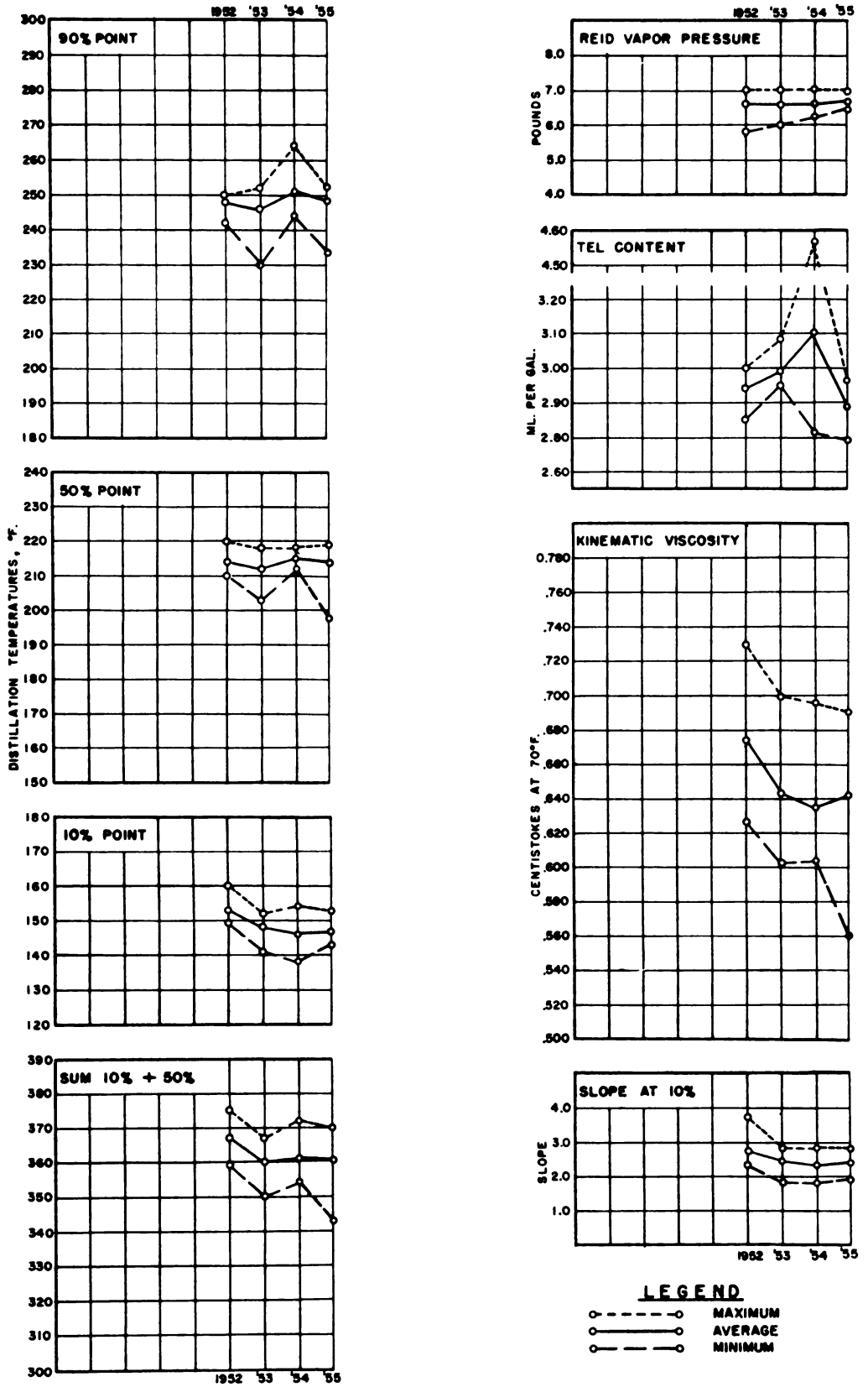

Figure 4.— Trends in grade 108/135 commerical aviation gasolines

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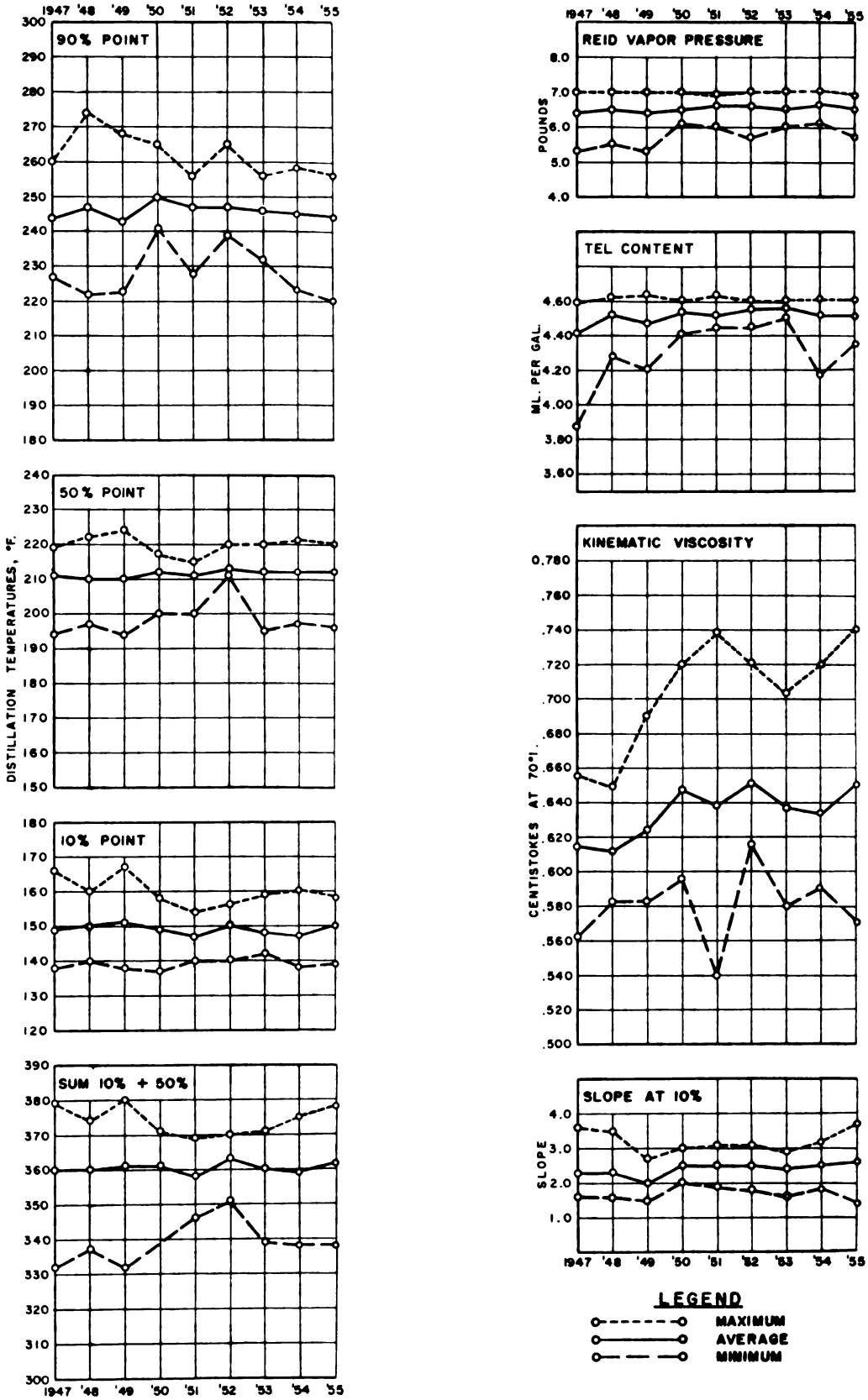

Figure 5. — Trends in grade 115/145 commerical aviation gasolines

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